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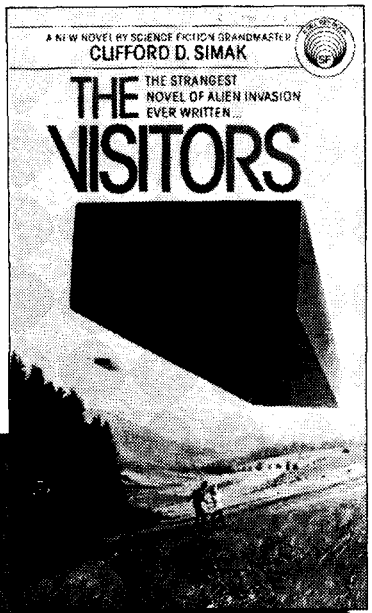
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EDITORIAL

SELF-FULFILLING PROPHECIES

By Stanley Schmidt

Some months ago, I raised a question to which I said I would likely return: "To what extent is an experiment invalidated if the results are affected by the experimenter's attitude toward the subject?"

Now is the time to come back to that. When I originally posed the question, I was talking about parapsychology research, and drew an analogy to the fact, well-known to actors and musicians, that the quality of a performance tends to be strongly affected by feedback from the audience. I now submit that the same principle applies in virtually *any* behavioral study of *any* sentient being.

And it *has* to be reckoned with, both in designing such studies and in interpreting the results. Taking proper account of the expectation-and-feedback effect is not easy, but it is essential.

Consider, for example, the recent spate of controversy over the validity

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of experiments suggesting that the ability of anthropoid apes to learn and use language is considerably greater than formerly believed. As you probably know, very early attempts to teach chimpanzees and gorillas spoken language were quite unsuccessful, at least partly because the animals' vocal equipment is not designed for the production of human speech sounds. But other kinds of symbol systems are available, not depending on vocalization, and several independent teams of researchers in recent years have attempted to teach these to apes, apparently with much greater success than previously. The chimp Washoe and gorilla Koko, we are told by psychologists Allen and Beatrice Gardner and Francine Patterson, learned American Sign Language (Ameslan). Chimp Sarah, under the tutelage of David Premack, used plastic symbols of various shapes and colors to represent words. Lana and other chimps used a computer keyboard system with a language called "Yerkish" developed by Duane Rumbaugh and Susan Savage-Rumbaugh. All of these researchers reported their pupils having acquired working vocabularies of one hundred to several hundred words, with at least some evidence of ability to combine them into new phrases to express new ideas (such as "drink fruit" for "watermelon") and even sentences expressing more complex ideas with a well-defined syntax.

Quite recently, these studies have come under attack by such workers as Herbert Terrace, Thomas Sebeok and Donna Jean Umiker-Sebeok, and Noam Chomsky, who suggest that the claims of linguistic ability mean far less than originally supposed. Much of what the apes have been doing, the new critics suggest, is mere mimicry and picking up on unconscious nonverbal cues rather than true use of vocabulary and syntax. The "successful" experimenters are accused of being so eager to prove what they'd like to believe that their eagerness has led them to provide such cues and thereby influence their results (and possibly their selection and interpretation of data). Some of these experimenters have themselves backed off somewhat in their claims (though I can easily imagine that this could be at least partly a cautious overreaction to any possible deficiency found by others in their methodology).

I submit that the recent criticism should indeed be viewed as valid questions—but *not* as answers. From what I have seen and read of these experiments, the case is far from closed. No doubt there were crudities in the experimental methodology; there always are, in a new field. That's why experiments are normally repeated with more and more refined methods. In this case, it is also exceedingly important for both supporters and detractors to realize that they are dealing with a very complicated system which *cannot* be controlled as closely or in the same way as an ideal physics or chemistry experiment.

Consider the objection that the apes are "merely mimicking" and "have no comprehension of syntax." Any reasonably observant parent can assure you that human babies start there—and they *do communicate*, sometimes very vividly, considerably before they master accepted adult grammar. There is a transitional period in which such a begin-

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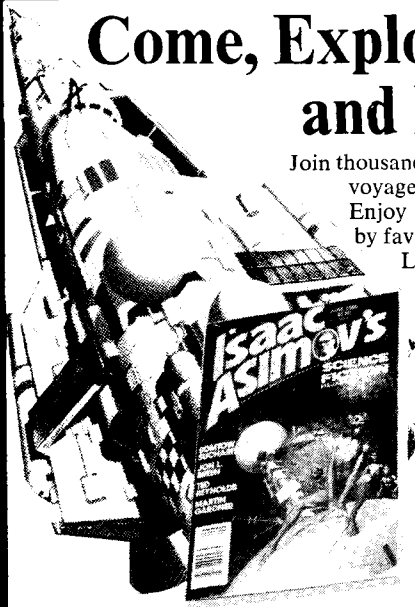

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ning speaker is saying the right things, for very definite purposes of his own, but probably still without much conscious comprehension of *why* those things are "right." At what point do you say he's "really speaking"? The real answer, I think, is not as simple as it is sometimes made out to be. The early stages of learning a foreign language in school often consist largely of rote repetitions of words, phrases, and grammatical patterns to instill a "feel" for them, and the same considerations apply there.

Herbert Terrace claims that his chimp subject, Nim Chimpsky, never mastered any appreciable grammar and his "speech" did not grow in complexity, as that of children normally does. Yet other experimenters claimed that their subjects *did* improve in these respects. Lives there a teacher of humans who hasn't noticed that individuals differ greatly and that some progress both faster and farther, sometimes by large amounts, than others? The fact that one individual does not behave in a particular way does not automatically invalidate any claim that others do. Terrace did review the work of the other experimenters and claimed to see similar patterns there, but there remain the obvious questions of whether he knew their work as *thoroughly* as they did—and whether his interpretations are to be considered *a priori* less (or more) subject to subjective biases than theirs.

Terrace also objects that the chimps showed little "spontaneity." Nim Chimpsky, for example, supposedly "talked," some 88% of the time, only in response to specific questions.

Come on, folks. Haven't you ever known any humans like that—especially when speaking a new foreign language? (Ask any language teacher how easy it is to get most of his students to say any more in class than they have to.)

And what was Nim Chimpsky doing that other 12% of the time?

The Sebeoks object that much of the apes' alleged language skill can be explained by the "Clever Hans" effect, wherein the animal picks up information from nonverbal cues such as changes in facial expressions, breathing patterns, etc. That may well be—but such things are an important part of our communications among ourselves, too. There've been quite a few studies indicating that a rather small fraction of the information passed from one human to another in a face-to-face confrontation is conveyed by the words themselves, a great deal of it being transmitted instead by "body language." If you speak a foreign language well enough to get along fairly comfortably shopping, you may be shocked at how poorly you do in your first *telephone* conversation with a native speaker. (I was.)

A speaker who tries to eliminate all "extraneous" cues when talking to someone in the same room—which means speaking in a monotone, with immobile face and posture—will likely be judged "cold and distant," and his listener will become uncomfortable and wander off to seek better company.

Sometimes the apes did things like smiling when asked to frown, or making the Ameslan sign for "drink" but touching an ear instead of a mouth. The experimenters attributed such actions to "joking" and "grasp of opposites"; the critics dismiss them as lack of real un-

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derstanding and the experimenters' interpretations as wishful thinking. Perhaps—but is either side *sure*, yet? Humans do exactly these sorts of things, at all ages, Adults make puns (you did notice Nim Chimpsky's name, didn't you?); a child learning to talk will often say something completely and deliberately nonsensical and then laugh uproariously (no doubt at the befuddlement of his adult teacher who is trying so hard to get him to be serious). A great many human behavior patterns are rather clearly derived from those of "lower animals," and primates in particular. Should we be so quick to assume this one isn't? We know apes are playful in other ways. . . .

Linguist Noam Chomsky is quoted in *Time* as saying: "It's about as likely that an ape will prove to have a language ability as that there is an island somewhere with a species of flightless birds waiting for human beings to teach them to fly." Well, maybe. But this claim ignores the possibility that there is more language use among the apes themselves than human researchers have yet realized. It also ignores the fact that latent abilities do exist, definitely in humans and possibly in other species as well. I do not know (and I think it's a bit early to assume that anyone else does either) how long our ancestors' nervous systems had the potential for speech before full-fledged languages were in general use, but I suspect that both processes were rather gradual and not necessarily simultaneous. I do know that I could not even begin to fly an airplane or play a trumpet until I was taught, and the teaching took quite a while. I rather doubt that Noam Chomsky was born able to compose or type critiques of linguistic research.

It may well be that the ape language researchers have been overzealous in seeing what they want to see, but it seems to me that the recent critics may be equally overzealous in seeing what *they* want to see. My objection is *not* to their questions, which are valid and deserve careful answers, but to their making them sound like answers in themselves, before adequate follow-up work has been done. It's just possible, I think, that they are at least as guilty as those they criticize of wishful thinking, the "wishing" in their case being the notion that sentient beings can be treated as simple systems, neatly conforming to precise experimental conditions defined and controlled entirely by the experimenter. They can't because they don't. Sentient subjects can and do take initiatives of their own, and that fact must be recognized and lived with in experiments with them.

This is a type of research in which, however "unscientific" it may seem to some, successful researchers *must* approach their work with at least a tentatively adopted attitude expectation of success. *Good audiences get better shows*—and I'm not talking just about somebody's subjective interpretation of the results, but about the *actual nature* of the results.

Several years ago John C. Lilly did some work with dolphins which encountered criticisms similar to the ones recently directed at the ape work—which is hardly surprising, since one of his main goals was to establish communication between humans and dolphins and he, too, thought he had achieved

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some success. In one of his books, *The Mind of the Dolphin: A Nonhuman Intelligence* (Avon Books, New York, 1967), Lilly wrote, "We have found that, in dealing with such a large-brained mammal, we must keep the working hypothesis in mind that 'they are highly intelligent and are just as interested in communicating with us as we are with them.' . . . If we use any other hypothesis, we have no success whatsoever in dealing communicatively with them. . . .

"Without such a faith and working hypothesis one makes bad mistakes in tactics and in strategy with the dolphins. If one assumes that they are stupid, they act in a stupid manner. This is partly because in the eye of the beholder, stupidity is seen everywhere, and partly because dolphins understand, catch on fast, and act the way one expects them to act. We have seen dolphins acting rather stupidly in care of persons who think of them as 'overgrown stupid fish kept in an aquarium.' These dolphins develop some delightful contrasts in new behavior when one of the 'believers' shows up and attempts communication.

"This is one of the basic difficulties in this new field. One must have an unusual amount of consciousness of faith in one's hypotheses in order to make progress."

Not surprisingly, this statement—this *attitude*—was the basis of a good deal of the criticism directed at Lilly's work. Far be it from me to claim that his work was above criticism, but on this point, at least, it seems to be that he is resoundingly right. His description of the

IT'S ANLAB TIME AGAIN! This issue completes 1980 for Analog; now it's your turn to let us know how we're doing. The authors are interested, I'm interested, and you should be interested—because your feedback about your likes and dislikes will have a second-order feedback effect on what we offer you in the future. So please vote. Here's how:

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dolphins' reactions to attitudes toward them I find eminently believable, if they are indeed intelligent. Certainly it is accurate for the other intelligent beings I have known. When I was teaching college, students gave me the most and best work when I approached them with the constant, sincere, and highly visible attitude, "I expect a lot from you and I honestly believe you can deliver it." Quite often they did, sometimes much more than they themselves had thought they could—and more than they did for colleagues who approached them with obvious skepticism about their ability to perform.

What it boils down to is this. *You* are an intelligent, sentient being; try this *Gedankenexperiment*. Suppose a foreign scientist approached you with the obvious attitude, "I don't really believe that you have the intelligence to communicate, but let's see you try."

Would you bother?

I rest my case. In dealing with any beings who may be intelligent—chimps, gorillas, dolphins, extraterrestrials—we will ultimately want to make quite sure that whatever communication we see is real and means what we think it does. Such questions as those recently raised will need answers—but those answers will have to be based on careful and realistic testing, taking into account the possible reactions of the subjects if they *are* intelligent, and not on casual assumptions. If any of these species *are* capable of real communication, to achieve that goal we're going to *have* to approach the problem with something more than a purely "scientific" attitude. Sentient beings are just too complicated—and sensitive and temperamental—to do otherwise. ■

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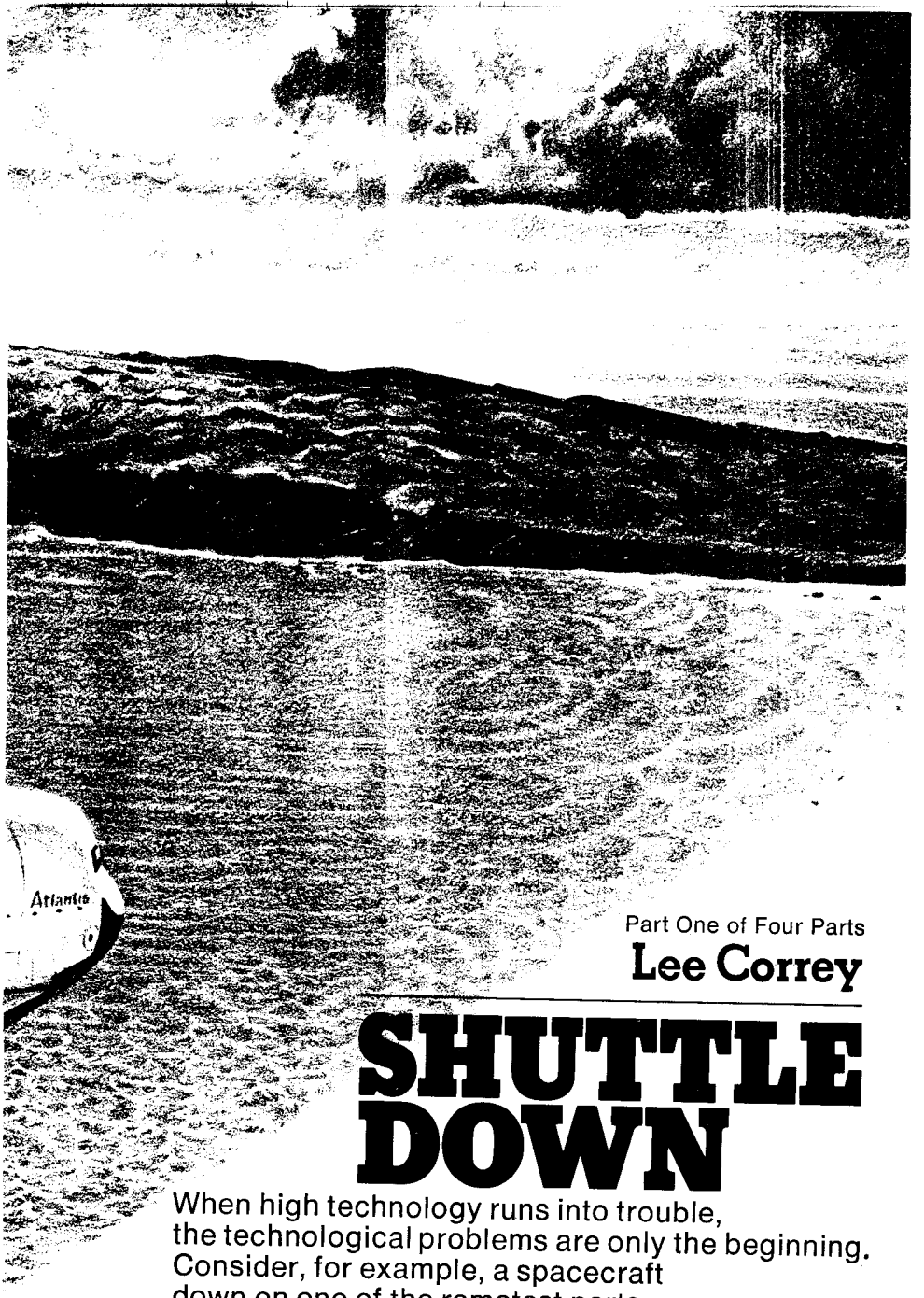

Part One of Four Parts

Lee Correy

SHUTTLE DOWN

When high technology runs into trouble, the technological problems are only the beginning. Consider, for example, a spacecraft down on one of the remotest parts of this planet....

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O Hotu Matu
'a i-unga-mai-ai
Ia Hau Maka. i toona tuura
Ka-kimi te maara mo te ariki
Mo te ariki, mo toma
Hotu Matu'a sent here
His servant Hau Maka
To search out a landing place
For the King to land.

—Rapa Nui folk saga

CHAPTER ONE

"T-minus thirty seconds and counting!"

"Launch Control, *Atlantis*. We're showing a low pressure light on the SSME manifold." Frank King seemed calm and cool as always just before a launch. But external appearances were deceiving. Inside, he was just as uptight as before the flight of any hot airplane or Shuttle mission.

"We don't see it on telemetry, *Atlantis*," the voice of Launch Control came back over Frank's headphones.

"Another damned glitch," co-pilot Lew Clay muttered. "This bird has always been squirrelly, Frank."

"T-minus twenty and counting!"

"Yeah, if it's real, the main engines'll shut down before they reach full thrust, and we won't get booster ignition," Frank observed. "Let's ride her." He triggered his mike switch. "*Atlantis* is go."

"Ten . . . nine . . . eight . . ."

The hellfire of a Space Shuttle launch was now so routine at Vandenberg Air Force Base that hardly anybody bothered to look up from their work. Only the Los Angelenos to the southeast might bother to look up through their smog to see the *Atlantis* climb into the blue morning sky on the tail of flame from her main engines and two solid propellant boosters. At Vandenburg, it was just another Shuttle mission into sun-synchronous polar orbit with either a Department of Defense satellite or a NASA Landsat; this time, it was the latter that was tucked into the cargo bay of the *Atlantis*. Space Shuttle OV-104. The ship was running light to get into polar orbit without the assist of the Earth's eastward rotation, an additional Orbital Maneuvering System (OMS) kit, or the external boost of a pair of Titan engines under the External Tank.

Frank King rode out the lift-off impassively, his eyes making their standard scan of the panel in front of him. His peripheral vision noted the movement of the points of light along the nominal trajectory plots projected on the display in the center of the panel. Things seemed to be going normally, but he couldn't shake the nagging feeling there was something *wrong*.

Nothing showed on the instrument panel. There were no alarms from the highly automated systems. The three digital computers that controlled the *Atlantis* during her boost into space signalled nothing amiss.

Yet he knew something was wrong.

He began to think about abort mode options . . . just in case.

There were too many years of flight in him—too many years of flying F-15's and F-16's screaming across the southwestern desert, too many years of handling SR-71 Blackbirds through the thin air of near-space, and too many years of boring supersonic holes through the sky in NASA T-38's. More than 5000 hours of hot-airplane jet time crowded his memory.

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Frank King had that elusive psychic connection with every aerospace vehicle he flew . . . and his car as well. He seemed able to reach out and make any machine an extension of his own senses. He'd spent his life doing this, being the master of machines that would and often did kill very quickly.

In fact, it had been practically his whole life.

And he was still alive, which was testimony not only to his skill as a pilot but also the extension of his ego into the machines he flew. Deep within him, however, he knew that it was because he was deathly afraid of every one of those machines and therefore *had* to master each of them to assert his human superiority.

Something was wrong with the *Atlantis*, and he tensed inwardly, waiting for it to happen, ready to take any one of a number of actions if it did, whatever it was.

Lew Clay didn't sense it in his copilot's seat as the increasing g-load pinned him deeper into the cushions. He, too, was an experienced pilot of hot airplanes that screamed through the skies of Earth. And he had more than a dozen Shuttle missions under his belt as well. As he scanned the panel out of habit and training, there was a little inner part of his mind that was elsewhere . . . because, in spite of the glitch, this seemed to be a normal flight. That little inner part of his mind was living last night over again with vicarious pleasure. Lew enjoyed being a Shuttle pilot for the same reason that motivated a lot of other hot pilots: Women.

The most sensual, the most desirable, and the most eager young women had always been attracted to the men of danger—the sailors of the high seas, the railway engineers, and—since the beginning of the twentieth century—the intrepid aeroplane, airplane, and aerospace pilots. Just outside the gates of Vandenberg in Lompoc, a Shuttle pilot could live like a shiek of far Araby. The same was true of the Cape as it had been true for Edwards Air Force Base before (and still was).

He was replaying last night with Shayla in the part of his mind that wasn't monitoring the fully automatic Shuttle launch. It was a great life, he was telling himself. Someday, he might end up as the command pilot in the left seat, but he didn't need to sit there to take advantage of the fringe benefits that accrued to a Shuttle pilot. He was content. He'd struggled hard to make it this far. Now he intended to enjoy the most advanced flying job in the world along with everything that went along with it. If ever there was a happy man, it was Lew Clay. At least, right at that moment.

The same could not be said for George Hazard whose nickname was obviously "Hap." As the payload specialist aboard who was primarily responsible for the NASA Landsat—it would be known as Landsat-XIII once Hap had powered it up, used the payload arm to extract it from the *Atlantis*, and placed it in orbit—riding in its cradles in the payload bay, Hap Hazard was doing a job he wanted to do . . . but he wanted to do more. He knew what the Shuttle was ultimately capable of: regular and inexpensive access to space for anyone who wanted it. And he was

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an angry man because it wasn't working out that way. Instead of riding herd on a Landsat, he wanted to be shepherding a load of structural components for a space station, a solar power satellite, or a space colony.

His mind wasn't yet with the Landsat riding behind him in the bay. His part of the mission wouldn't start until King and Clay had stabilized the orbit so he could get to work.

If it wasn't for the pinch-penny Administration coupled with a Congress that doted on social programs at the expense of high technology efforts such as space, he told himself, the U.S. could be well on its way to becoming the major space power as well as operating on the leading edge of the technology of the high frontier.

There was so much to do! Hap always fretted about this.

But right then he could only do this job, and he was good at it. He was known for being one of the best payload specialists in NASA. He didn't do much flying; this was only his third Shuttle mission. He spent most of his time with his payloads from the day they were first turned on in the contractor's plant until he placed them in orbit.

In the meantime, as the *Atlantis* climbed to orbit, Hap had to dream that he was taking part of a space station into orbit rather than a prosaic Earth-oriented Landsat.

In the seat beside him on the flight deck, Jacqueline Hart knew her part in the flight as mission specialist. She'd been over the flight plan until it was committed to memory. She wanted to be known as the best mission specialist in the program, and her reputation was already growing. She was good. The best, some said.

She was a pilot, too . . . and a good one, as might be expected. As the *Atlantis* climbed on its back to space, her eyes were on Frank King. She was not looking at him as a man, but as a pilot. She'd never flown with him before, and she was watching his every move because Frank was known to be one of the best. *Another couple hundred hours in the T-38's,* she was thinking, *and I'll have the high-performance jet hours to qualify as a Shuttle pilot.* And that she wanted more than anything else in her life. It occupied her thoughts day and night when she was not working equally as hard at being the best mission specialist in the Shuttle program. She knew an outstanding reputation as a mission specialist certainly wouldn't hurt her chance of upgrading to pilot status.

The gang of hot pilots at Houston who ran the Shuttle manpower scheduling knew that she wanted to be a Shuttle pilot at the expense of anything else in her life.

If Jackie Hart ever made the upgrade to pilot status, it would be because she was an outstanding pilot, period. She never would or never could make the grade through utilization of feminine wiles. She was an attractive woman who could have been beautiful if she'd wanted. She was, instead, almost a female characature of a man, of the hot pilots she was counted among.

She was, as one ex-fighter jock put it, hard as nails and capable of whipping her weight in infuriated wildcats.

"*Atlantis*, Houston. Coming up on SRB burnout. Everything looks copasetic."

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"Uh, roger, Houston," Frank grunted as the g-load was now rising to 3 gees, making it difficult for him to talk. "Joe, anything showing on that . . . low level indication . . . we got before lift-off?"

"Negative, *Atlantis*. All telemetry looks good. As old Shorty used to say, all systems A-Okay! Does something appear wrong?"

"Ah . . . negative . . . Okay, SRB burnout! We've got SRB separation indication. Both SRB's away." The acceleration had dropped back to one-gee as the two big solid units burned the last of their propellant and were separated from the external tank. The acceleration would build slowly back up to three gee's again as the liquid hydrogen and liquid oxygen were burned out of the big External Tank, making the Shuttle lighter and requiring that the three main rocket engines in the tail of *Atlantis* be throttled back by the computer to keep the acceleration low.

"Okay, *Atlantis*, flight path's nominal . . . going right down the pike," the voice from Houston told him unnecessarily.

"Roger that, Joe. Panel looks normal," Frank told him, his eyes continuing to scan because he still *knew* that there was something wrong somewhere.

Still time for a "return to launch site" abort, he told himself.

But the *Atlantis* continued to drive for orbit on her back. Her trajectory was, according to the display on the panel before him, slightly east of due south, an ascent path that would put her in a slightly retrograde circular orbit two hundred nautical miles above the surface. The orbit had been designed so the Landsat would be in "sun-synchronous" orbit, meaning the cameras in the satellite would be looking down at the Earth at the same local or sun time on every orbit.

Four minutes and ten seconds. Frank scratched the "return to launch site" abort possibility from his mind. They couldn't make it back now; they'd have to go into the "abort once around" mode . . . if they could. But it would be another five minutes before the *Atlantis* would achieve sufficient velocity to make that possible.

Frank began to relax inwardly. His experience told him that if something were going to happen, it probably would have happened before now. The solid boosters had separated cleanly and on schedule. The displays told him the *Atlantis* was thrusting along according to plan. There were no caution lights, no warning lights, no malfunctions, and no indications of any impending malfunction. The entire flight thus far had been that way.

Maybe I'm getting jumpy, he told himself. Maybe time to take that vacation with Ellie that he'd been promising her for so long. The last four years of their married life hadn't been that smooth, but the life of a Shuttle pilot's wife wasn't supposed to be smooth. Not with NASA's policy of running their pilots on a minimum of six missions per year . . . and preferably twelve to permit them to maintain a high level of proficiency that couldn't be kept up in ground-based simulators.

In the Houston simulators, the technicians could throw all sorts of emergencies and malfunctions at him without endangering an expensive Shuttle Orbiter. In some ways, the simulator runs

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with their emergencies were fun for Frank, a big game where he tried to outwit the technicians. *Flying a simulator helps,* he thought, *but it isn't the same as having your pink bod strapped into the real thing. You can't throw up your hands in defeat and walk off the flight deck on a real flight . . .*

A strange sensation brought him back to the reality of the flight of the *Atlantis.*

The acceleration was no longer holding him into the back cushions of his pilot's seat.

"MECO!" Lew snapped.

"Main Engine Cutoff? Why?" Frank snapped back, scanning the panel.

There were red lights everywhere.

"Don't know."

They were back in the simulator again. They had to be! This couldn't be real. In all the years of Shuttle operations, there'd never been a premature cutoff of main engine operation.

Frank reacted as he would in a simulator . . . except that he felt that dry-mouth and hard stomach fear that never occurred in a simulator. Lew worked in unison with him. They both knew what to do. And they did it almost instinctively.

"Jettison the ET." There was no sense in carrying the extra weight of the big External Tank. There was no way to restart those three main engines, and Frank knew that the ET was now penalty weight for whatever they had to do to get down safely.

There was a little jolt, then the feeble acceleration of the *Atlantis'* thrusters pushing the ship away from the tank. "External Tank away," Lew replied in a calm voice.

"Houston, *Atlantis*, ah . . . trouble here." In spite of the fact that adrenalin was pounding through his system and fear was a lump in his throat, Frank managed to maintain the cool, calm, drawling voice of the professional pilot, an aerospace tradition that had been handed down over the years from when Chuck Yaeger started it during test flights of the Shuttle ancestors, the Bell X-1's, at Edwards Air Force Base in 1947.

"We see it, Frank." Joe Marvin replied from the Mission Control Center in Houston, his calm and cool drawl being relayed through the Tracking and Data Relay Satellite 23,400 miles above the Earth and back to the *Atlantis.* "Don't know what caused it. Worry about that later. Computer coming up with a landing point for you. Stand by for a possible OMS burn."

"Roger, Joe."

"There isn't a hell of a lot out there ahead of us except water," Lew observed. He was pushing data into the shipboard computer. A pictorial of the South Pacific Ocean appeared on the display with the track of the *Atlantis* superimposed on it.

The track of the *Atlantis* ended in the South Pacific Ocean.

Another manipulation on the computer keypad by Lew produced the landing footprint of the *Atlantis* on the screen.

Frank looked at it. "Can't quite make the coast of Peru or Chile. Too far cross-range. Any islands out there, Lew?"

"*Atlantis*, Houston. You have *a* landing point, Frank. You can't make the west coast of South America or any of the Polynesian Islands. You've just got one piece of dry ground between

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you and Antarctica."

Lew came up with the answer simultaneously with the computer from Houston.

"Isla de Pascua," the co-pilot said.

"Easter Island," Mission Control said.

"Has it got an airstrip we can use?" Frank wanted to know.

"Stand by, Frank. We're on the horn to National Ocean Survey right now. We'll get the latest data on whatever airport's there."

"Co-ordinates: twenty-seven degrees ten minutes south, one-oh-nine degrees twenty-six minutes west," Lew read the computer display unnecessarily. "Forty-eight hundred nautical miles from Vandenberg and a little more than two thousand nautical from the coast of Chile. It's four hundred sixty miles left on our ground track."

Frank was also keying his computer pad. "Sixty-three second OMS burn," he remarked, referring to the additional velocity that would be needed to reach Easter Island from their present position, said velocity to be provided by the pair of 6000-pound-thrust engines of the Orbital Maneuvering System housed in the two bumps on either side of the *Atlantis*' tail fin.

"*Atlantis*, Houston. Frank, you're lucky. Then again, you're not. You've got an airstrip waiting for you. Stand by to copy the data," Joe Marvin's voice crackled.

"Ready to copy, Joe."

"Mataveri Aerodrome, Isla de Pascua." Joe Marvin at Houston was obviously repeating what he was hearing over a telephone from the National Ocean Survey offices where the charts were. "Hard-surfaced runway. Eight thousand eight hundred fifty-eight feet long by a hundred feet wide. Runway one-zero or two-eight. Suggest using runway one-zero because of runway slope. Approach and elevation one-thirty, departure end two-twenty-three. No TACAN. VOR frequency one-one-seven-point-one. Non-directional radio beacon, frequency three-oh-five kiloHertz. Both the VOR and the NDB are at the approach end of runway one-zero. Control tower frequency one-one-eight-point-one. Stand by one, NOS says the VOR, NDB, and tower are on request."

"Get 'em on the air for us," Frank snapped. "I can land this brick manually, but not without some sort of radio aid to tell me where to aim it. And we can't work the NDB because nobody put a good old low frequency Automatic Direction Finder aboard this flying anvil." As a matter of fact, Frank thought, they wouldn't have put a standard VHF Omni-range receiver and indicator aboard if the Shuttle pilots hadn't pointed out that a lot of potential contingency landing fields around the world didn't possess the TACAN radio navigational system of the U.S. Department of Defense.

"Stand by, Frank."

"Roger. Okay, Lew, let's set this thing up for Easter Island." He turned and handed the scrap of paper with Mataveri's numbers to Jackie Hart. "Here. Hang on to these. Read them off to us if we call for them."

Jackie looked at the numbers and shook her head. "I was afraid that's what I heard. Frank, you'll have to hit that runway dead-nuts. Start your final

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flare long before you cross the threshold or you'll never have room to stop."

"You just let me worry about that, Jackie. We've got a runway. That's better than finding out whether or not this brick'll float long enough for us to get out of it."

The two pilots calmly set things up for the necessary OMS burn for the added velocity to stretch the glide of the *Atlantis* to Easter Island. It was a puny boost when it came, a mere 12,000 pounds of thrust pushing against the 150,000 pound mass of the *Atlantis*. But a little over a minute's worth of that puny shove was enough. Frank made the cross-range correction with the vernier engines and waited until the *Atlantis* had dropped low enough into the atmosphere for the aerodynamic controls to have an effect.

"*Atlantis*, Houston. Frank, I told you you're lucky," Joe Marvin's voice came through to them. "We got through to Santiago by phone, direct dial, believe it or not. The operations office of the Chilean national airline. LAN-Chile, tells us that one of their Seven-Oh-Seven's just took off from Isla de Pascua . . . So the VOR's operating and the tower's manned. You're doubly lucky because there's only one flight a week out of there . . . and that was it."

"Roger, Joe. We're on our way," Frank replied.

"Any problem with making it, Frank?" Joe wanted to know.

"Yes . . . and no. But we've got to make it, so we will." He didn't tell Houston he was saving some OMS burn time for contingency. He intended to shoot the approach short and use some OMS rocket thrust to stretch the glide if necessary. After hours in the Houston simulators, it was a trick he'd worked out for himself. It didn't have NASA's blessing . . . but he was the space craft commander who was between the rock and the hard place at the moment. He'd do what he had to do in order to get the *Atlantis* down in one piece. After that, it was Houston's worry . . .

Lew had dialed-in the VOR frequency for Easter Island. "Too far out," he muttered. "Still have a flag, and I can't get the Morse code identifier yet. Pick it up in about . . . two minutes."

"Can you land this thing manually without the microwave landing system, Frank?" Hap wanted to know.

"Nobody's ever done it before," Jackie pointed out.

Frank nodded. "Did it in the simulator. Had to fight like hell to get them to set it up for me, but I've practiced it. I can do it. It won't be easy, but I've got lots of runway with an up-hill slope to it," the pilot replied, concentrating. "Okay, Lew, I've got control response on the sidearm controller."

There was never any question in his mind at the time—only later when he thought about it and got the shakes—that he could land the *Atlantis* on an 8858-foot runway with no automatic landing system to help him. Shuttle Orbiters usually landed under automatic control, guided by the super-accurate Microwave Scanning Beam Landing System on the ground. To do it with only a VHF Omnirange station to provide horizontal direction with no distance information and no vertical glide slope data would take everything he knew about flying the Shuttle Orbiter.

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The fear was still there, but it was a different kind of fear this time. He knew what the situation was. He knew what he could do and would do. It was a far different fear than riding along and wondering what was going to happen. The emergency *had* happened. The malfunction *had* occurred. The mission *was* aborted. Now he knew exactly what he and Lew would have to do.

The same sort of quiet fear coursed through co-pilot Lew Clay. Now he realized why Shuttle pilots were the jocks of the day, why the fringe benefits were so good, and why he was sitting in the right seat. He was going to earn his salary for a change. But the judgement calls would be Frank's; he was just a backup man. He didn't know right then whether or not he could handle the sort of responsibility that was riding on Frank at the moment. Maybe it was just as well, he told himself, that he was sitting in the right seat. Maybe he never wanted to move into the left seat. Maybe that was why he was happy where he was.

But there really wasn't too much time for the two men to think. The *Atlantis* had dropped through the upper atmosphere quickly, her stubby wings reaching for lift to glide and her black bottom hardly getting warm in comparison to the searing heat of an ordinary entry into the atmosphere from orbit. True, her tiles got hot, but not the searing white-hot ablative heat of entry.

"Two hundred thousand feet," Lew called out. "Okay, I've got the VOR signal."

"Set me up for the two-eight-zero radial inbound on the reciprocal, Lew," Frank ordered. "Houston, *Atlantis*. You wouldn't by chance happen to have the current Mataveri weather, would you?"

"Negative, *Atlantis*. Best we've got is the GOES photo, shows generally clear in the area, maybe some high, thin clouds. Suggest you try the tower."

Frank wanted to say something, but he didn't. The comm panel was over on Lew's side of the flight deck. "Lew, dial up the Pascua tower."

Lew's right hand went quickly to the overhead panel. "You've got it."

Frank's course plot on the display showed they were about 50 miles out . . . if he could rely on the inertial data from the guidance system. But he had to. He had no TACAN with its distance measuring equipment to guide him in. In fact, he didn't have even the simplest commercial distance-measuring equipment because Isla de Pascua didn't have anything more than an ordinary, everyday commercial VHF Omnirange station and the even more primitive non-directional radio beacon which the *Atlantis* didn't have the receivers to use anyway.

The island was set up to handle an occasional commercial flight, not an emergency landing of the super-sophisticated NASA Space Shuttle with its advanced electronics and communications equipment—UHF, TACAN, Microwave Scanning Landing Beam System, and S-Band pulse-modulated voice transmissions to orbiting relay satellites.

Somewhere along the line, Frank thought fleetingly, maybe the super-sophisticated technology should have left a little room for a lot of the old technology that was already in place and working just fine.

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"Pascua Tower, Shuttle Orbiter *Atlantis*. Mayday! Mayday! How do you read? Over?"

The voice came back tinged with a heavy Latin accent. Frank had heard it before: Spanish-speaking air traffic control operators over the Caribbean or Spain. English might be the international language of air traffic control, but that didn't mean that pronunciation and accent was universal. "*Atlantis*, theese ees Pascua Tower. I read you loud and clear. What ees the nature of your emergency, please?"

"Pascua Tower, *Atlantis*. We're a United States Space Shuttle Orbiter. We've had a propulsion malfunction that prevented us from going into orbit. We *must* land at Easter Island because we have no power. We're forty miles northwest at one-five-zero thousand feet, landing Mataveri in less than five minutes. I've got only one chance to make it. What's your weather, please?" Frank snapped back curtly. Time to worry about the consequences of such undiplomatic language later. He was getting pushed for time.

"*Atlantis*, Mataveri weather is thirty-thousand high thin broken, visibility ten kilometers, wind one-three-zero at ten, altimeter one-zero-six-five millibars. Landing Runway one-zero. I do not have a visual on you yet. Please report the field in sight. Over."

"One-hundred thousand feet," Lew reminded him.

"Roger. Watch that display and call out the distances according to the inertial navigator. I want to keep heads-up for the island."

"Three-five miles."

"Okay, we've got the VOR needle in the center. Setting up a twenty-four degree glide slope. Lew, the OMS system hot?"

"Roger."

The conversation became terse but not panicky. There were white knuckles gripping the arm rests where Hap Hazard and Jackie Hart sat, but not in the pilots' seats. It was strictly professional hot piloting. The cockpit recording tapes would later reveal an unreal professional calmness in the voices of the two men.

The *Atlantis* broke through the thin cloud layer at 30,000 feet, and the South Pacific Ocean sparkled below. Frank peered intently through the forward windows, straining to see the one single spot of land in two thousand miles of ocean.

"Twenty-thousand feet. You're drifting left of the radial."

"Tally ho!" Frank called out at the same instant that both Hap and Jackie, watching over the shoulders of the two pilots, saw it too.

Easter Island lay dead ahead.

The black strip of Mataveri Aerodrome cut across the narrow southwest neck of the island.

"Pascua tower, *Atlantis*. We have the field in sight."

"*Atlantis*, thees ees Pascua Tower. You are cleared to land, but we have no fire trucks available."

"I hope we won't need them, Pascua Tower. But we may have to evacuate the ship quickly once we've landed."

"Roger, *Atlantis*. We will do what we can to help you."

"Hang on, gang, we may make it without an OMS burn," Frank muttered. He began to talk to himself aloud

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as he manually flew the *Atlantis* down to the ground, a habit he'd picked up years ago as a green student pilot shooting his first instrument approaches into Cincinatti's Lunken Field . . . except this time he had no instruments other than his experienced eyes to rely on, no data other than his own memories of shooting landings like this in the Houston simulators, and absolutely no expertise at all doing it with a full Space Shuttle Orbiter operating with a payload aboard. He was glad that the avionics and computers hadn't failed; he was getting the right amount of computer-generated feedback through the stubby sidearm controller that was the *Atlantis's* version of the old control stick of airplanes past. "Hold her in there. Drifting right now. Down on the nose. Keep that airspeed up. Lew, give me altitude and airspeed call outs."

"Ten thousand five hundred. Three hundred knots."

"Sounds good. We'll make it. Like landing a brick. Who told NASA this thing was a glider? Keep the nose down . . ."

"Five thousand. Three hundred knots."

"Turbulence. Steady her in there. Little high. Energy management, that's what we need. Got plenty of energy, plenty of altitude and airspeed to make the strip . . ."

"Two thousand. Three hundred knots. Inertial system says one mile."

"Not that accurate this close. Okay, pull up. Here we go. Three degrees. Looks good. Hold it. Hold it. *Gear down!* Bleed off the airspeed. Runway threshold coming up."

The end of the Easter Island runway was rushing at him. He fought a pilot's natural instinct to haul back on the stick and get the nose up more to lose airspeed. It was the first instinct of any green pilot when first trying to land in the Shuttle simulator.

"Altitude too low to read. Three hundred maybe. Two-twenty knots . . . bleeding off . . . two-oh-five . . ."

"Over the fence." It was almost a shout from Frank. Not willing to use up a single foot of runway more than he had to, he popped the speed brakes on the vertical fin and dropped the *Atlantis* to the runway.

It hit with a cloud of smoke from the four tires of the main gear contacting the asphalt at more than 200 miles per hour. The impact almost drove the wheels through a runway designed and built to handle the gentler landing of a commercial jet airliner.

Frank pulled the sidearm control stick back as far as possible, keeping the nose high. "Brakes," he snapped. "Override the anti-skid if you have to, Lew. We're running out of runway."

Two parking aprons on either side of the runway flashed past. The nose wheels dropped to the pavement as the brakes came on. Frank really wasn't worried. The *Atlantis* could be stopped in 5000 feet if necessary . . . and he'd touched down within a thousand feet from the end of a runway almost 9000 feet long with an uphill gradient. He'd get it stopped in time.

But slowing 150,000 pounds of Orbiter from 200 miles per hour to a dead stop isn't done quickly . . . or without a lot of braking effort. The designers said that it could be done in 5000 feet.

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But the designers weren't flying it. This wasn't the drawing board or the computer terminal. This was the runway at Mataveri Aerodrome on Easter Island, and it was the real Orbiter *Atlantis* trying to come to a stop.

But the designers were right. The computers were right. And Shuttle Command Pilot Frank King had done everything just right.

The Space Shuttle Orbiter *Atlantis* with four people and a Landsat aboard came to a shuddering halt 800 feet from the end of the runway on Easter Island in the South Pacific Ocean.

Lew was covered with cold sweat. "Jesus H. P. Christ, Frank! That was one hell of a job."

Hap said nothing. His face was white, but color was beginning to come back to his cheeks.

"Damned fine landing, Frank," Jackie snapped. If she looked cool, Frank knew she wasn't. The slip of paper with the Mataveri data on it was crumpled and wilted in her damp hands.

Frank sighed. He wasn't sweating. He hadn't had time to sweat. He'd been very busy. Now he looked around out the side windows of the flight deck. "We're down. The worst is over."

He didn't know how wrong he was.

CHAPTER TWO

The telephone rang.

Casey Laskewitz swung his desk chair around from where he was typing the latest news release into the word processor:

"The NASA Space Shuttle *Atlantis* lifted from Vandenberg Air Force Base, California, this morning carrying Landsat-XIII into orbit around the Earth. The Landsat-XIII is the latest in the modern generation of satellites designed to monitor Earth resources and detect pollution . . ."

He hated to be interrupted when he was cranking out a news release on the Shuttle. It was important that each of them be done correctly to project the proper image of the Shuttle to both the media and the general public. At least, it was important to K.C. Laskewitz.

He grabbed the phone. "NASA Public Affairs, Space Shuttle Media Relations, Laskewitz speaking."

"Casey, Reed Richardson."

A grin broke over Laskewitz's long face. "Hey, Red, how'd the launch go?"

"It didn't," came the flat reply from the NASA Mission Manager in Houston. "Casey, move on Project Shuttle Down."

"Ohmigawd." Casey Laskewitz made it sound like a single word. He grabbed a pencil and a sheet of scratch paper. "Where? Anybody hurt? Details?"

"Easter Island."

"Easter Island? That's ten billion miles from *anywhere*!"

"How right you are. King reports the *Atlantis* is on the ground at Mataveri airstrip there. All personnel are okay. The Orbiter is apparently undamaged. We don't know what happened, but there was a premature MECO. Your shots current?"

"Uh, yeah. Were the last time I checked."

"Okay, get moving. The team's meeting here in Houston at eighteen hundred hours local this afternoon. We'll try to be on our way by twenty-one hundred from Ellington, the Air

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Force willing."

"That's fast, Red, but I'll get the media clued in right away," the Public Affairs man replied. "Use your name on the Shuttle Down Release Number Three?"

"Yeah, okay, but nobody'll be able to reach me. Joe Marvin'll handle things here in Houston until you get your shop set up on Easter Island. Uh, Casey, maybe you oughta let old Uncivil Service himself handle the release. He'll have to coordinate it with the State Department. We've got no agreement with Chile for contingency landing rights on Easter Island. Gotta go now. See ya at sixteen-hundred." And the phone went dead.

"Sonofabitch," Laskewitz growled under his breath. He slammed the phone into its cradle, his mind racing. This wasn't the ordinary Shuttle Down contingency landing that NASA had tried to prepare for in advance. Several years of delicate negotiations conducted by State had resulted in contingency landing rights in Spain and Okinawa. But nothing with Chile!

Somebody'd forgotten to cover the bases for polar orbits.

Wait a minute, Laskewitz thought. Somewhere there was a United Nations' Treaty on rescue and return of astronauts and space objects. He grabbed the phone and dialed a number.

"June, Casey Laskewitz. Get me the full text of the U.N. treaty on astronaut rescue, and get it up here *fast*!" he told the woman down in the NASA library archives. Without waiting for an answer, he turned back to his console, punched the code for Shuttle Contingency Releases, and peered at the memory directory that flashed on the screen.

Why, Casey asked himself, *had the Front Office tried to weasel-word an emergency by calling it a "contingency?"*

In anticipation of the Shuttle Down possibility, he'd pre-written several press releases using bogus Orbiter and crew member names. He had only to call up the releases from the computer memory, run global search and replace to insert the right names and other data, and run out a print copy. Quickly, he checked the text of four releases, selected one, typed the data into his keypad, and told the word processor to print it. Then he swung around and grabbed the telephone again.

Reed Richardson was playing it as cool as he could in spite of the incredible situation. Mission Control had quieted down following King's landing at Mataveri. Now the monkey was on Richardson's neck as the Mission Manager in overall charge of the flight of the *Atlantis* from check-out to final unloading and refurbishment.

First things first as far as he was concerned. Although the procedures manual said one thing, he'd done what he considered to be the number one job: notify Casey Laskewitz and get the proper story out to the media before somebody leaked a rumor. It was easier to get the story out first and worry about the possibility of dealing with the bureaucrats on top of him than to wait and then attempt to explain away the nonfacts of unfounded rumors. And there was always the possibility that some eager science reporter was monitoring the Shuttle frequencies on a scanner. Or

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some eager science buff might have picked up some of the satellite transmissions from the TDRS and figured out that the *Atlantis* was down. It might have happened, although the chances were slim. Hardly any reporter covered a Shuttle Launch anymore, and it didn't even rate mention as a a sidebar on page 86 these days.

But Reed Richardson knew that Project Shuttle Down would be the top news story of the day . . . and he thought he knew how the media would handle it. After all, they'd been on NASA's ass for spending all that money in space ever since Armstrong and Aldrin showed the world once and for all that the Good Old United States could whup the Commies in space if they wanted to do it. Now, the news media couldn't care less, except to occasionally blast the space program as an unnecessary government boondoggle, a waste of tax money that could be put into social programs instead . . . so that, in effect, the Department of Social Welfare could spend the NASA annual budget in less than four days.

Reed Richardson was very bitter about it. He didn't appreciate the way the news media was treating the leading edge of American technology.

So the Shuttle Mission Manager in charge of the Landsat-XIII flight of the *Atlantis* knew exactly whom he should call first: Casey Laskewitz at Public Affairs.

Having done so, he then started to follow the NASA procedure for Shuttle Down and called his boss.

And with considerable trepidation.

The Shuttle mission and their technical problems weren't his biggest headaches. His boss was Number One Problem because of the System.

In order to eliminate insofar as possible the appointment of civil service personnel as part of a political spoils arrangement, the Civil Service Commission had, over the course of decades, built a monumental edifice of rules, regulations, and policies that, when put into action, usually accomplished what they were designed to prevent: the retention of incompetents in the top-level GS grades.

The "System" could be manipulated, and it was. Being a negative power system consisting of rules and regulations concerning "thou shalt not," it left room aplenty for those who'd bend the rules. And it was set up so that any advance in grade was determined by the number of people a person supervised . . . *not* on the quality of his work.

Just hang in there, baby, and if you do it long enough you'll advance up the ladder of GS ratings as the people on top leave for better work in the private sector. Then you can move up and have the corner office with a credenza and a secretary. You'll never make supergrade, but if you don't make any mistakes you'll keep moving up.

To say that Reed Richardson was bitter with the System was an understatement. But he hung on because he felt the only way to get mankind into space was to play the game in the main tent.

But his boss was a perfect product of the System. That's why Reed Richardson was reluctant to call his boss.

Duke Kellogg was a fixture at Johnson Space Center. Richardson often

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thought it might be better if Duke had been turned into a statue gracing the parklike atmosphere of Lyndon Johnson's little tidbit for the State of Texas. The statue couldn't have talked back.

"Duke, Red," he said over the phone after Kellogg's secretary connected them. "The *Atlantis* just went down on Easter Island in the Pacific. Frank King and Lew Clay made a beautiful manual landing on Mataveri airstrip there. Premature, MECO. I need your authority to initiate Shuttle Down."

Duke Kellogg was an old Air Force jet jock who hadn't made the grade to the flight astronaut status in Apollo or SkyLab, and he was now considered too old to fly the Shuttle. But his reply on the phone exhibited that same affected, cool, drawling, Good Old Boy Tennessee accent. "Waal, now, let's not get our water hot, Red. Crew okay?"

"Yes."

"How about the Orbiter?"

"King reports he got it on the ground without any landing aids except his calibrated eyeballs," Red replied curtly.

"The man's good," Kellogg observed unnecessarily. "Can you patch me into the net with him? I want to talk to him."

"Duke, their communications are down," Red reminded him. "King and Clay have their hands full right now powering-down the *Atlantis* without any ground support equipment to help cool things off. They shut down the fuel cells right after they reported a successful landing. We know they're down, and we know they're okay. I've got to get Shuttle Down moving right away."

"Okay, wait one. Lemme get the procedures manual here."

"I've got it in front of me, Duke. What do you want to know?"

"Just want to make sure we proceed in an orderly fashion, Red. We spent a lot of time and effort working out the plans for contingency landing on foreign soil. When the crunch happens and the panic button gets pushed, that's why we've got the procedures manual with everything worked out ahead of time. Keeps us from making mistakes."

"For God's sake, Duke, I know what has to be done! I need your authorization to proceed. We've got twenty-five percent of the United States manned space flight capability sitting helpless on a runway two thousand miles from anywhere. I need to get the teams moving, the equipment lined up, the Air Force off the dime . . . in short, Shuttle Down activated. Your office and Headquarters can worry about the implications and rescheduling the next three months' flights . . ." He didn't tell Duke Kellogg that some of his people were already on the horn to Marshall Space Flight Center to get the stiffleg derrick ready and a mobile crank rented, and to Dryden Center at Edwards for the 747 carrier aircraft, NASA 905. "And, Duke, you'll have to coordinate with somebody at Headquarters. We don't have a contingency landing agreement with the government of Chile."

"What's that got to do with it?"

"Easter Island's owned by Chile," Red reminded him.

"Oh. In that case, we've got to interface with State."

"Probably, but that's not my worry."

"Okay, I'll handle it. You notified Headquarters?"

"Negative," Red lied. Then he

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couldn't resist tweaking Duke's tail a little bit, do he went on, "According to the procedures manual, that's your job, Duke. Give me clearance to get started, then you'd probably ought to call the Front Office. The bird's been on the deck for seven minutes now."

"Ah, you're right, Red. Okay, you obviously know what you're doing there, and you've read the book. Go on Shuttle Down! I'll call Headquarters then scat right down to Mission Control there. That way, I can stay on top of things with you."

Great! Red thought. *Thank God I'll be on a plane to Easter Island before the day is out*! He knew the Mission Control crew would keep things in order here. They wouldn't start working the next mission of the *Columbia* out of the Cape for another five days. And they knew better than to let Duke Kellogg try to take over. Joe Marvin would see to that. Even Duke Kellogg found it hard to argue with a Shuttle pilot who'd been retired off active flight status after twenty missions and burned hands from opening the hatch on an emergency basis after an otherwise normal Cape landing.

"Hi, hon, Casey. Look, I've gotta go to Easter Island so I won't be home for about two months . . . Sorry, hon, but we've got a Shuttle down there. And it's my job . . . I know, I know . . . But we've talked about the possibility of this . . . I'm leaving for Houston with Jake Hardin in less than thirty minutes. He's up here from the Astronaut Office with a T-38, and he'll fly me back this afternoon . . . Yeah, Jessica will mail my check directly to you while I'm gone . . ."

"Colonel Hubbard."

"Matt, Reed Richardson in Houston."

"What's the good word, Red?"

"Shuttle Down."

"Oh, great! Where?"

"Easter Island in the South Pacific."

"Can't you pick a better place, Red?" the Air Force officer asked, looking up at a map of the world behind his desk. Just as he thought: the Military Airlift Command didn't have a base within thousands of miles.

"I didn't pick it, Matt. Frank King and Lew Clay had an emergency out of Vandenberg," Red told him flatly. "It was either Easter Island or the drink."

"Okay, listen, I'll get the staff working on the problems," the young bird-colonel replied, thinking that this might be one that'd justify him getting out of his MAC office at Andrews Air Force Base and maybe logging some time. He could see from the map that it was going to be a big, long-range operation . . . and he didn't think that the Air Force had developed any contingency plans for Easter Island. "There're going to be problems with operations into Easter Island, Red. I'll tell you more about them in a few hours. In the meantime, we'll get a C-5 Galaxy out of Dover to Huntsville to pick up the stiff-leg. Anything else while I'm at it? Need fighter cover?"

"Got anything available to airlift our intential team of fifteen people into Easter Island?"

"I'll check. What's the airfield like? I'm running through my FLIP chart

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book here, but I don't find Easter Island listed at all."

"Try looking for Isla de Pascua, Chile on your Jepp charts."

"Hoo boy! Yeah, I've got it in front of me now. I don't know if we've got landing rights . . ."

"We will. Just get things moving, Matt. Going to take this one yourself?"

"You read my mind, Red. Stay at Mission Control. I'll be back with you shortly."

"I'll be here. We're not going anywhere without the Air Force . . ."

"Hell, Joe, NASA Nine-Oh-Five's in the shop with the engineers undergoing maintenance. There's a new Airworthiness Directive out on the burner cans," Hank Hoffman said into the phone, looking out his window to where he could see the huge tail of the 747 Shuttle carrier sticking out of the hangar of NASA's Dryden Flight Research Center at Edwards Air Force Base in California's Mohave Desert. "It'll be at least a month before the shop gets those cans reworked at the rate we have to move around here on the tight budget."

"Hank, we've got Shuttle Down operations going here with full authority to proceed according to the procedures manual," Joe Marvin explained. "Consider that you've got full authority to go to Pan Am or American or United or *anybody* who flies Seven-Four-Sevens—even to Pratt and Whitney if you have to. Get your engines any way you can, but get them fast. Let me know what you need in the way of purchase orders or contract obligations or whatever. We're pulling in Danny Davis from JPL as contracting officer. He'll be here until the team leaves for Easter Island. You gotta have NASA Nine-Oh-Five on Easter Island according to schedule for the recovery."

Casey Laskewitz burst out of his office and started down the long corridor at Headquarters toward the corner office occupied by his boss, Roger Service. But he didn't get there. He met the NASA Public Affairs deputy coming down the hallway almost at a full run toward him.

"Laskewitz, we've got the *Atlantis* down!"

Casey nodded. "I know, Roger. Here's the release, ready for your approval."

"How did you find out?" Roger Service wanted to know. "The Administrator himself just called me."

"Richardson phoned me from Houston," Casey explained as he led his boss back into the Shuttle PAO office.

"Why did he call you first? Why did I have to find out from the top?"

"Because that's the way it's laid out in the Shuttle Down procedures manual," Casey reminded him.

"Oh. Well, if that's what the book says, that's the way we do it. I want to call a meeting of you and your people for two o'clock."

"They already know what to do, and they're doing it . . . and I'll be on my way to Houston with Jake Hardin in a T-38," Casey said, indicating the bags sitting next to his desk. He kept four bags there, each fully packed with a week's worth of clothing for tropics, arctic, desert, or temperate climates. "But, Roger, there's a big, fat problem

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here that you've got to handle because it isn't in the book and I'll be out on Easter Island."

Roger Service hesitated for a moment. If it wasn't in the book, there were no plans laid out. And that meant there'd have to be new plans and procedures worked out. Given the situation with the *Atlantis* on the ground, this meant the new procedures would have to be worked out in a hurry . . . probably in some all-night sessions. He'd gotten tired of that sort of thing in the old public relations rat race on Madison Avenue where decisions often had to be made fast and furiously in reaction to any number of happenstances. Here at NASA, he'd found a very comfortable job in what he considered his profession: public relations. Service did his job by the book. Procedures were everything these days. Even planning the procedures involved procedures that were religiously followed. "What's the problem?" he asked.

"Easter Island," Casey explained. "We have no contingency landing rights agreement with Chile who owns it."

"So? Isn't there a U.N. treaty or something?"

Laskewitz picked up a sheaf of papers from his desk and handed them to his boss. "Yup. Here's the text of the treaty itself. Haven't read it. Haven't had time. I didn't clear the news release myself according to the book because Department of State is probably going to have to get involved in this . . ."

"I haven't got the authority to interface with State," Service complained. "The Administrator's going to have to do that."

"It'd make the Office look pretty good if you were the one to bring it to his attention, wouldn't it?"

"Uh . . . yeah, it would, Casey. Thanks. I'll get right up there to him."

"Okay, Roger, I'll call you from Houston. I'll feed you stuff out of Houston and Easter Island for official release here . . . according to the procedures manual." Casey Laskewitz glanced at his watch. "Jake's waiting for me down in the parking garage right now."

"Wait a minute." Roger Service tried to bring his subordinate up short. "I haven't signed your travel authorization yet."

Casey grinned and waved a manila envelope as he picked up Suitcase Number One. "Sure you did. Remember? Couple of months ago after I got my shots. It was part of the procedure, Roger. See ya!"

"We can't get through to them?"

"We can't get through to them, Red," Joe Marvin explained. "There's no telephone link to Easter Island. No cable. No satellite ground station. Just an old low-frequency radio station at Hangaroa, the only village on the island."

"How about checking with the Chileans in Santiago?" Richardson suggested. The pressure of the past hour was getting to him now. His stomach was upset, and he was fighting off the tension hiccups he usually got when under extreme stress. Ordinarily he was a cool customer, and he'd been selected for his position because he was. He wasn't an ex-fighter pilot, but the old fighter jocks who ran so much of the manned space flight program had decided that Reed Richardson was, in essence, one of them and could therefore

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be trusted to keep a cool stool and a hot pot. The boys with the Right Stuff felt they could trust guys like Richardson, just as they trusted most of the experienced FAA air traffic controllers they worked with.

Joe Marvin sighed and placed his gnarled hands on the edge of the controller's console. "Red, who do I call? Who do I talk to there? What do I say? And am I authorized to make such a call? Dammit, you've trained us all in the detailed procedures that this outfit dearly loves, but there's *no* provision for calling the President of Chile. Not only is my Spanish lousy, but that recent problem down there is something even the CIA doesn't like to think about."

Red almost lost his cool at that point. He grabbed for a telephone handset. "Dammit, we've got four people and several billion dollars worth of Orbiter sitting down there! I'll call *somebody* and get through to them!" He reached out to punch the dialing buttons.

Joe laid a scarred hand on his boss's arm. "Red, sit down and take five. They're safe for now. They'll get that bird cooled down because it didn't go through much of an entry." As Richardson slowly replaced the handset in its cradle, the former astronaut went on, "So what are you going to say to them? Hey, man, we landed one of our space ships on one of your islands by mistake, and we'd like to come and get it? And we're arriving with our military C-5 transports and other aircraft, plus at least a hundred people? Red, their 'students' tried to storm our embassy in Santiago six months ago."

"Sorry, you're right," Richardson said with a sigh. "I've gotta assume that Headquarters has gotten in touch with the Department of State and something's in the mill. But it just galls the hell out of me to be sitting here in the middle of all this super technology that's totally *worthless* right now. We can communicate with the Voyagers out a couple of billion miles in the outer Solar System . . . but we can't even make a telephone call—much less a simple radio contact—to an island in the Pacific Ocean! Right now, Easter Island could be as far away as the stars for all we can do . . ."

Alfred M. Dewey sighed and looked at the pad of notes he'd just made during the telephone call from his boss, the Assistant Secretary of State. He didn't like what he saw. And he didn't relish the nasty job that had just been dropped in his lap . . . with full authority to do whatever was necessary, but please coordinate with the Assistant Secretary to make certain that no diplomatic protocol got crossed up in the process.

In spite of the fact that Dewey was a State Department specialist in high technology interfaces with South American nations, he still had an ancient wood-cased vacuum-tube intercom set on his desk. He flipped two switches down, pushed the talk handle, and said, "Miss Fisher? Mister Sullivan? Please come into my office immediately. This is reasonably urgent, so drop whatever you're doing. And please bring something to take notes with . . ."

In the hallowed corridors of what was called Old Foggy Bottom, that simple understated request amounted to something that would have been classed as an immediate order across the river in

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the Pentagon. Joyce Fisher and Nash Sullivan walked into Dewey's office less than two minutes later.

Youngsters! Dewey thought with some disdain. What was State coming to? These two had been the bane of his existence since they'd come aboard in June following their graduation from MIT and Cornell respectively. The seasoned State Department administrator had immediately found himself on the defensive when they'd been assigned to his office staff, not because they were young, but because they were both bright and aware of current technology.

Sullivan was a tall, gangling redhead who might have been more at home on a basketball court. The young man was, instead, an electronic engineer, Phi Beta Kappa, and summa cum laude. Unlike many young technical people, he'd picked up a minor in political science. To some extent, Dewey felt threatened by Nash Sullivan in spite of the fact that the young man had a very pleasing personality and no apparent willingness to play the little games of internal politics that went on around him. His puppylike eagerness showed in his greeting to Dewey,"Hi, boss, glad you called. I just worked out a solution to that Honeywell computer deal in Argentina . . ."

"It'll have to wait a bit. Sit down, please," Dewey told him.

On the other hand, Joyce Fisher disturbed Alfred M. Dewey as she followed Sullivan into the office. She had disturbed him ever since her initial interview with him. He'd wanted to tell Personnel he couldn't use her, but he'd found himself confirming her for one of the two slots he had available. As a bachelor in his middle years, Alfred M. Dewey had either found women unattractive and therefore unstimulating . . . or so overpoweringly attractive that he was afraid of them. However, Joyce Fisher affected him as no other young woman had. It wasn't that her dark-haired sultry appearance was provocative or even exceptionally beautiful. And it wasn't her soft voice that spoke Spanish was well as English. To Dewey, it was the way she moved and acted and spoke that stirred strange feelings within him. *If only she wasn't young enough to be my daughter*! he once thought to himself. But he had no daughter. Like Sullivan, Joyce Fisher exhibited the eagerness of youth and the enthusiasm for her job that would probably wear off after several years of battling the Department and its policies and protocols. She merely nodded and sat down, smoothing a wrinkle out of her pants suit as she settled back in the chair.

Dewey cleared his throat and began by telling the two of them, "I'm going to have to pull both of you off your present assignments temporarily and put you on a rather urgent matter that's just come up." At his words, Sullivan raised his thin eyebrows. Joyce Fisher cocked her head sideways with an intent expression on her face.

"It seems the chaps over at the Space Agency have created a small international incident," he went on slowly, trying to keep his eyes off Joyce and on the notes he'd taken. "One of their space ships has made an emergency landing on Chile's Isla de Pascua just about an hour ago. I can understand why we haven't heard from the Chilean Em-

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bassy yet. They probably don't know about it. In fact, Santiago may not. The situation is confused, to say the least."

"I'd expect as much," Sullivan put in. "From what I know of the area, Isla de Pascua is probably the most remote place on the face of the Earth."

"It's known to the natives as Rapa Nui," Joyce Fisher put in. "But they also call it *te Pito o te Henua*, which means 'the navel of the world,' or 'the center of the world,' depending on the translation."

"So the Space Shuttle went down," Sullivan mused. "It was bound to happen sooner or later. But, Chief, don't we have international agreements giving us emergency landing rights?"

"With Spain and Japan," Dewey pointed out. "But not with Chile. True, Chile signed the U.N. treaty on astronaut and space vehicle rescue and return. That doesn't seem to be adequate for the space people. Seems they've got only four of these Space Shuttles and they've booked flights and taken money down and a whole list of other things. They want that Shuttle back as quickly as possible."

"Boss, if I remember that U.N. treaty, the Chileans have to return it to us," Sullivan began, then stopped to think for a moment and went on, "however, I don't know how they're going to do it. They don't have the capability. That thing must weight more than fifty tons, and it doesn't have any engines of its own that would permit it to be flown through the atmosphere."

"The Assistant Secretary made me well aware of the technical facts," Dewey said testily, trying not to let this youngster get the better of him when it came to such things. "The United States has to go in and get the *Atlantis*. According to NASA, that's going to require C-5 Galaxy military transport planes, plus other military transports carrying about a hundred people, plus the NASA Seven-Forty-Seven airplane that can carry the *Atlantis* on its back."

"Can't NASA do it alone without help from the Air Force?" Joyce wanted to know.

"They own only the Seven-Forty-Seven," Dewey pointed out. "Because they've been on such a tight budget for the last decade or so, they couldn't afford to buy and maintain the fleet of large transports required to carry out an emergency rescue mission such as this."

"Yes, they've always relied on DOD for space craft recovery and other emergency facilities," Nash Sullivan observed, taking notes. He looked up suddenly. "Chief, is the current Chilean government going to let us land military aircraft on their territory to pick up the *Atlantis*?"

"*That* is only *one* problem," Dewey said, tapping his pencil on his note pad. "Diplomatic relations are slightly strained at the moment following the recent incidents." He sighed and went on, "We've been given the job of handling the diplomatic side of this rescue operation. According to the Assistant Secretary, the Secretary himself has given me carte blanche to handle this, and it's on a rush priority basis. NASA wants to get its recovery teams on their way *this afternoon*."

Nash Sullivan whistled.

Joyce Fisher shook her head in disbelief.

State didn't usually work that fast,

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and all three of them knew it.

"So this conference is going to be short," Alfred M. Dewey went on. "We're not to let either NASA or DOD accuse State of dragging its feet on this one. We've been given priority orders. Full use of discretionary funds have been approved. Sullivan, I want you on the next plane to New York; you're going to be the Department's technical man at the U.N. . . . and we're going to need to interface on that level because of the U.N. treaty. Miss Fisher, because of your familiarity with the region and your fluency in the language, I want you to be State's direct representative on the NASA recovery team. Get to Houston as quickly as you can. Get in contact with the NASA people—I have their names here. I'll coordinate from here." Dewey got to his feet and looked at his watch. "I'm due at the Chilean Embassy in twenty minutes for a meeting with the *chargé d'affaires*. Sullivan, stay in touch with me through our U.N. mission. Miss Fisher, I'll stay in touch with you through NASA until you get to Santiago; then use our embassy's diplomatic channels . . . but I want you either in Santiago or Isla de Pascua, wherever you feel the situation requires. And you've got a very difficult job with the current situation as it is."

Joyce Fisher replied cooly, "It may not be as difficult as you've told me. I think I can handle it, Mister Dewey." Her reaction was also one of quiet eagerness. She was finally going into the field to work on a delicate diplomatic mission concerning high technology. True, her degree in chemical engineering from MIT hadn't covered many of the aspects of astronautics, but she felt her familiarity with South America was far more important than a detailed technical background. And she was right.

Sullivan was grinning from ear to ear. This was just the sort of assignment he'd always dreamt of. What other young college graduate had ever had such an important job dropped in his lap within months of joining such a large government operation? "Yessir, I'll be on the first flight to New York once I can get a bag packed."

In a large concrete building near the Potomac River in Langley, Virginia, another conversation was going on: "Chief, NASA's dropped a Shuttle Orbiter into Easter Island. State's certain to be involved in the recovery operations which are going to be extensive. I felt you should know about this because it's probably going to have a severe impact upon our operations in Santiago. I want to activate three of our sleeper agents, including the one on Easter Island."

Another report was being given at an Embassy located at 1125 Sixteenth Street N.W.: "Comrade Ambassador, as the KGB representative here, I must inform you that the Americans have made an unauthorized emergency landing of their Space Shuttle *Atlantis* on Chile's Isla de Pascua. The recovery effort of the Americans will drastically affect our programs in Chile. But this accident of theirs will give us an opportunity to hamper their competitive space effort. The *Atlantis* was launched from the military Vandenberg Air Force Base complex and is carrying what NASA claims is an Earth resources satellite. However, why would the Amer-

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icans devote an entire expensive Shuttle payload to a single Earth resources satellite? My information says that the payload is actually a nuclear-powered satellite carrying a high-energy laser beam weapon for the military purposes of their Department of Defense . . ."

CHAPTER THREE

"Emergency power-down. We have no ground support cooling equipment." Frank said crisply.

Although they hadn't gone through a full entry with the maximum heat load that would be encountered in such a maneuver, the *Atlantis* had picked up some aerodynamic heating. And the operation of the three fuel cells providing electrical power plus the two auxiliary power units powering the hydraulic system created internal heat loads. Normally, ground service trucks would quickly pull alongside after landing to blow cool air into the *Atlantis* because of these heat-generating devices and the electronic equipment that had to be kept cool. It was different here on the runway at Mataveri, however. Very different.

Lew shut down the last fuel cell, thereby cutting off their communications with the TDRS satellite and with Mission Control at Houston. But Frank's last brief message from the *Atlantis* had told Joe Marvin they were safely on the runway at Mataveri, that there was no damage to the ship, and that the four of them were okay.

So far as Frank was concerned, there was no time for worry about what Mission Control and NASA would do. He was familiar with the gross details of the contingency landing program. Help would be on the way shortly.

In the meantime, he was still in command of the *Atlantis* and fully responsible for her. Not only did he have to worry about doing the right things for the Orbiter, but he had the well-being of his crew to think about. "Hap! Jackie! Get the hatch open. Get the survival kits off-loaded. And get out of this bird. Lew and I will be out just as soon as we get everything shut down. We've still got a couple thousand pounds of toxic hypergolics aboard."

The mission specialist and the payload specialist didn't need any further urging. They'd been through the emergency drills before. They knew the hazards associated with a contingency landing without ground support elements to cool off the critical systems, drain off the hypergolic propellants that were also highly toxic, and disarm those pyrotechnics that were still functional. The two of them were unstrapping almost at once. As the two pilots worked over the panels, the specialists dropped through the hatch to the mid-deck.

As they extracted the emergency egress equipment from the lockers on the mid-deck, Jackie couldn't help commenting to Hap, "Damn, that was one hell of a fine landing!"

Hap didn't look up from where he was unstrapping equipment from a locker. "Could you do as well, Jackie?" he asked quietly.

"Probably."

"Well, when you can honestly say you know you can, maybe Duke'll give you a try . . ." And he let it drop at that.

Jackie straightened up and put her hands on her hips. "Listen, Hap . . . " she began aggressively.

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Hap still didn't look up. "Jackie, if the hypergolics are leaking in the tail section, we'll get a free ride back to Vandenberg on the shock wave . . . So let's fight later, okay?" He tossed part of the emergency ground survival kit at her. She caught it. He dug the rest of the components out of the storage areas while she stacked them by the still-closed side hatch.

"That it?" she asked, now cooled down.

"Yeah."

"I'm opening the side hatch. It's getting hot in here."

As the side hatch flopped horizontally outward, the thermal apron deployed around its edges. And a breath of warm, moist, ocean-scented air rushed in. Jackie crawled out on the hatch and looked around.

"It's like landing on the moon!" she exclaimed.

"What do you mean?" Hap stuck his head out the hatch and looked.

There wasn't a tree to be seen anywhere. To the north, several volcanic cones rose into the sky, their slopes covered with brownish-green grass. There were rocks everywhere. Except for the black asphalt runway of Mataveri Aerodrome, there was no sign of humanity anywhere.

And it was quiet.

Save for the soft whisper of the sea breeze blowing along the runway and the creaking of the *Atlantis* as her structure cooled, there was no sound, not even the squall of seagulls.

Jackie tossed a glance toward the tail of the *Atlantis*. "Visually, we look okay back there, Hap. Drag out the rope ladder."

"What rope ladder?"

"That's right, you don't know about it." Jackie crawled back into the mid-deck and went to her personal effects locker on the forward bulkhead. Months ago, she'd argued with the experts at the Cape about some means for getting back aboard the Orbiter after a contingency landing. Standard "emergency egress" consisted of a chinning bar attached to the hatch from which a crew member could swing down and then drop the distance of ten feet to the ground. But there was no way to get back. After fighting a losing battle against experts who maintained that (a) there was a slim chance for any contingency landing now that the Shuttle System was operational, and (b) if there *did* happen to be an emergency, she wouldn't want to get back aboard anyway, Jackie'd bought an eight-foot hemp rope ladder normally sold as an emergency home fire escape and simply put it in her personal effects package that accompanied her on every flight. Maybe the NASA engineers who didn't fly Orbiters didn't think such a device was necessary, but Jackie wasn't going to fly without it. She'd learned the game of J.I.C. (Just In Case) early in her flying career.

By the time Frank and Lew climbed down from the flight deck, she and Hap had the ladder installed.

"What's that?" Frank wanted to know.

"You want to be able to get back aboard?" Jackie asked him. "I've been carrying that rope ladder in my kit for the last seven flights."

"Good thing they don't know everything we carry along, isn't it?" was Frank's only comment. "We're all

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powered down, but let's get out of here just in case we've got propellant vapors accumulating in the tail section." He waved at Jackie. "Ladies first."

"This is supposed to be an equal opportunity crew," Jackie reminded him, her liberated side showing.

"Okay, then, ancient law of the sea takes precedence: Women and children first." Frank fired back. "And don't ask which I consider you to be right now. Just get out that hatch before I spank you . . ."

He looked like he meant it, so Jackie moved.

After dropping the survival kits down to the ground, Frank was the last to crawl out the hatch and clamber down the rope ladder to the runway. "Okay, let's get away from this bird. Down the runway, back toward the tower over there . . ."

"Wonder why nobody's come out?" Hap wondered as the four of them shouldered the survival kits and started to walk down the strip.

"Yeah, no 'Follow Me' jeep. Hell of a reception . . ." Lew added. "Man, what a desolate place! Not a tree anywhere. If it wasn't for the grass and the bushes, I'd think we landed on another planet . . ."

"For all practical purposes, we did," Hap said. "If we'd landed on the moon or Mars, we'd be on TV right now with two-way communications. But when Frank makes a landing like that one, naturally there's nobody around to see it."

"Don't be so sure," Frank remarked, shifting his part of the survival kit to his other shoulder. "Here's comes your Follow Me jeep, Lew."

From down the runway, a jeep sped toward them. It drew up and came to a stop. Three men disembarked.

They were three totally different types of men.

One wore a military uniform with strange pips on the shoulder boards. He was short, wiry, and clean-shaven with carefully clipped and groomed black hair.

The second was obviously a Catholic priest attired in the usual long flowing white robe and with a gold cross dangling from a neck chain. He was about the same age as the military man but wore a long, untrimmed black beard with streaks of white running through it. He peered at the world through a pair of round, rimless eyeglasses and with an expression of interest and concern.

The third was a civilian with a bushy black moustache and carrying a black bag. But this man was heavier with a fat belly hanging out over his belted white trousers.

Frank broke the ice. "Good afternoon, gentlemen. Thank you for letting us use your airfield. Otherwise, we'd be in the ocean."

"Good afternoon," the military man replied in excellent, unaccented English. There was no hint of caution, aggression, or suspicion in his voice. In fact, there was no hint of any emotion whatsoever. "I'm Captain Ernesto Obregón, Armada de Chile, and the military governor of Isla de Pascua." He extended his hand to Frank.

Frank took it and shook hands, replying, "Governor, I'm Frank King, command pilot, United States Space Shuttle Orbiter *Atlantis*."

Obregón looked past him at the *At-*

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lantis. "Yes, I recognize the aircraft and your space agency's markings. I didn't think I'd ever see one on Chilean soil, much less on Isla de Pascua . . ."

"Neither did we, sir," Frank told him pleasantly. It was quite obvious that the Governor was a well-educated Latin American who had been raised and trained in the upper class of the South American culture. *La dignidad del hombre* would be sacred to this man, even on this remote South Pacific island which he governed, and Frank was therefore going to treat him with all the deference and protocol possible. After all, the commander of the *Atlantis* knew he was in no position to do less . . . and that there'd probably be enough problems generated anyway before they got the *Atlantis* off this island.

"Permit me to introduce the members of my crew," Frank went on. "My second in command and co-pilot, Lewis Clay . . . my payload specialist, George Hazard . . . and my mission specialist Jacqueline Hart." He didn't give a damn what Jackie thought; he'd deliberately introduced her last for the simple reason that women's lib hadn't made the slightest dent in the Governor's culture yet, but chivalry, on the other hand, was an integral part of it.

Obregón shook hands with the other two men, then raised Jackie's hand and kissed it. "Gentlemen, Senorita, welcome to Isla de Pascua."

Jackie blushed at the greeting from this suave Chilean. What thoughts she might have had about insisting on being treated equally never got to first base. In all her life, she'd never had her hand kissed before. Americans didn't do that sort of thing. She found herself wishing that more American men would. It was a stimulating gesture, as millions of Europeans and Latins already knew.

"You're all civilians?" Obregón asked.

"The National Aeronautics and Space Administration of the United States is a civilian organization," Frank explained. He gestured toward the *Atlantis*. "As you can see, there are no military markings on the ship, and none of us wear military uniforms. Oh, our flight suits are alike because they're fireproof, and we wear the U.S. flag. But we're all civilians." Frank was, in fact, a full Colonel in the Air Force on assignment to NASA as a shuttle pilot, and Lew was a Commander in the U.S. Navy on the same sort of assignment. But, insofar as *this* situation went, they were NASA civilians, and Frank intended to keep it that way for reasons that became obvious with Obregón's next statement.

"Excellent. There might be problems otherwise." Obregón seemed greatly relieved and moved on to the next item on his obviously well-thought out if hastily-planned agenda, "Please permit me to introduce the members of my welcoming party."

The priest was Father Francisco. His only remark, uttered upon shaking Frank's hand, told the shuttle pilot why the military governor had brought him along: "Welcome to my island."

The plump man was not Chilean at all, in spite of his obvious Latin appearance. Doctor Victor Esteban was introduced as the doctor on the island—the only doctor—and it was obvious from the black bag that he'd come along in case of injuries. "*Ia or-*

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ana oe! Welcome to Rapa Nui," he exclaimed as he shook hands, even with Jackie. He spoke English well with an accent that was not Spanish, but a strange mixture of a Spanish accent and something else. The question was partly resolved as he went on, "The world may know it as Isla de Pascua, but those of us who were born here still call it by its real name: Rapa Nui. Are you all well? Any injuries? Any others aboard your aircraft who might need my help?"

When the crew of the *Atlantis* looked at one another briefly in some confusion about this, Doctor Esteban added, "Have no fear. I'm no Polynesian witch doctor. I know the idea enters the minds of some of the few tourists we get here. University of Mexico, residency in Valpariso, then back here to my people."

"Governor," Frank put in, "it's urgent that I be permitted to use your radio to contact the United States. They're awaiting word from us, and we must start making the necessary arrangements to get the *Atlantis* off the island and back to the U.S."

"I'll be happy to co-operate, Mister King, but first things first," Obregón replied, holding up his hand. "Chilean laws require that I take care of a few items of protocol. Nothing serious, but I have to make regular reports to Santiago. May I see your passports, please?"

"Passports?" Lew repeated in disbelief.

"Captain, we have no passports with us," Frank broke in. "We never anticipated having to land the *Atlantis* on foreign soil."

Captain Obregón thought about this for a moment. Then he sighed. "No passports, and no visas? Do you have *any* documents with you that will serve as identification and proof of national origin?"

Frank looked baffled but managed to answer, "No, but we have our names on our flight coveralls here. That serves to identify us."

"That's hardly an identification document, Mister King."

It was the quiet Hap Hazard who stepped in at this point. "Your Excellency," he addressed the military governor by the proper title, "I realize that we've landed here without the necessary personal documents required for international travel. But we beg your indulgence because this was an unanticipated landing. And the problems of weight in space travel prevent us from carrying along everything that might be necessary in the way of international documents." Hap had been around, especially in Europe, and knew the ins and outs of immigration and customs. "If our commander can use your radio to contact the United States, all of the necessary documents will be provided to you when the rescue team comes here to get the *Atlantis* out."

The military governor shrugged. "Under the circumstances, there is no great problem for the moment. I'm sure we can work something out before I make my monthly report. However, I'll have to inspect your aircraft and its cargo. Customs regulations, you know. May I see your aircraft's license, its certificate of airworthiness, and its cargo and passenger manifest, please?"

Again, this request set Frank back on his heels. The *Atlantis*, in common with the other three Orbiters, didn't have a U.S. Certificate of Airworthiness issued

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by the Federal Aeronautics Administration because of an agreement more than a decade old between NASA and FAA when NASA convinced them that the Space Shuttles were not aircraft and therefore didn't have to conform to FAA specifications. As a matter of fact, Frank thought, the *Atlantis* didn't even carry radio transmitter licenses that were required under international law. He'd flown enough non-military aircraft to know of these things, but it had never occurred to him that the *Atlantis* would need those things aboard in the event of a contingency landing.

"I'm afraid that space vehicles don't carry such things, sir," he told the Governor.

Obregón sighed again. "International law requires them, Mister King. How do we know what you're carrying? How do we know the origin of the aircraft and its airworthiness?"

"Well, there's a builder's plate attached to the bulkhead that says the *Atlantis* was built by Rockwell International at Palmdale, California."

Again, Hap put in, "Your Excellency, if you'll let us know what documents you require, we'll talk to the United States and have them available for your inspection as soon as the first members of the rescue team arrive here. None of these standard requirements for ships and aircraft were considered to be valid for spacecraft because of the U.N. Treaty relating to the rescue and return of astronauts and space vehicles . . . and I believe your government signed that Treaty."

Captain Obregón was obviously becoming as confused and befuddled about this as Frank. He really didn't know what to do with this huge black and white monster covered with bricklike tiles that was sitting on the runway of the island he governed. It was *obviously* a United States space craft, and these people were obviously Americans. But they had *nothing* in the way of documents to prove anything they said . . . and he was out on a limb if he didn't demand to see such things.

On the other hand, he thought, what could he do? He couldn't deny them entry to Isla de Pascua. They had no way to get off the island. And he couldn't impound the *Atlantis*; there was nothing on the island that could move it off the runway.

He took the easy way out because he wouldn't have to make his report to Santiago until the end of the month. Perhaps the Americans would come up with the necessary documents before that time. "Ah, well, we'll make allowances in this case, Mister King. I'm sure that your rescue teams will bring along the necessary documents for me to see. In the meantime, however, it would put my mind at ease if Doctor Esteban and I could inspect your aircraft and its cargo. Doctor Esteban enters and inspects all incoming aircraft for public health purposes, and . . . "

"Be happy to have you do so, Governor," Frank told him with a slight smile, "except we're far too close to the *Atlantis* right now. There're still rocket propellant chemicals aboard her that're highly toxic to human beings. Until we can get experts with the proper equipment here, it may be dangerous to go aboard, much less to be within a kilometer of her." Catching the quick look that flashed across Obregón's face,

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Frank went on, "But you're welcome to look. You won't be able to see much in the payload bay; there's no light there."

Obregón, as a military man, was familiar from his training with the nature of rocket chemicals used in rocket-powered guided missiles. He didn't want to deal with such things right then because he wasn't equipped to do so. "Can you get it off the runway?" he wanted to know.

"Do you have a tow tug?"

Obregón shook his head. "The LAN-Chile jets that fly into here don't stay. They leave for Tahiti or return to Santiago within an hour after arrival. We have no means to tow them or to refuel them."

"Then the *Atlantis* will have to sit where it is," Frank told him.

"Can't you taxi it down to the south ramp?" Doctor Esteban wanted to know.

Frank shook his head. "The *Atlantis* is an un-powered glider. It can't move on its own once it's on the ground." He looked at his ship sitting in the middle of the runway only 98 feet wide. "There isn't room to turn it around, even if you did have a tow tug." It was beginning to dawn on Frank that the situation was considerably more complex than he'd originally thought. And he was growing more convinced every second that all aspects of a contingency landing had *not* been considered and prepared for.

"You mentioned that the rocket chemicals still in the *Atlantis* are toxic," Doctor Esteban said, looking toward the Orbiter with obvious unease. "What are the chemicals?"

"Nitrogen tetroxide," Jackie Hart told him.

Esteban thought about this for a moment, then observed, "Your Excellency, it will indeed be necessary to talk to Santiago by radio immediately. I have no means to handle any emergency involving human inhalation of nitrogren tetroxide fumes. It's known as a poison gas!"

"I believe this jeep will carry the seven of us," Captain Obregón observed.

"Red, Matt Hubbard," the voice of the Air Force Colonel came over the telephone handset. "You've made my day, buddy. The problems we've got with Shuttle Down, you wouldn't believe."

Richardson sighed. "Solving problems or finding people who can is what I get paid for, Matt. What's the matter?"

"Oh, nothing very serious—except that Easter Island is so gawddamned far out in the boonies that it hasn't got *anything* except a barely adequate runway. And no fuel; I've got to bring in every drop of jet fuel we use if I need to refuel any aircraft there. And the bloody place is two thousand nautical miles from Santiago *or* Tahiti."

"Look, you guys fly the Atlantic and Pacific non-stop everyday," Red pointed out.

"Yeah, I know, we're the supermen of the airways . . . except we put our pants on one leg at a time just like you guys at NASA," the Colonel shot back. "Listen, Red, I wasn't kidding. We've got real problems supporting your operation on Easter Island. For example: No C-5's to begin with."

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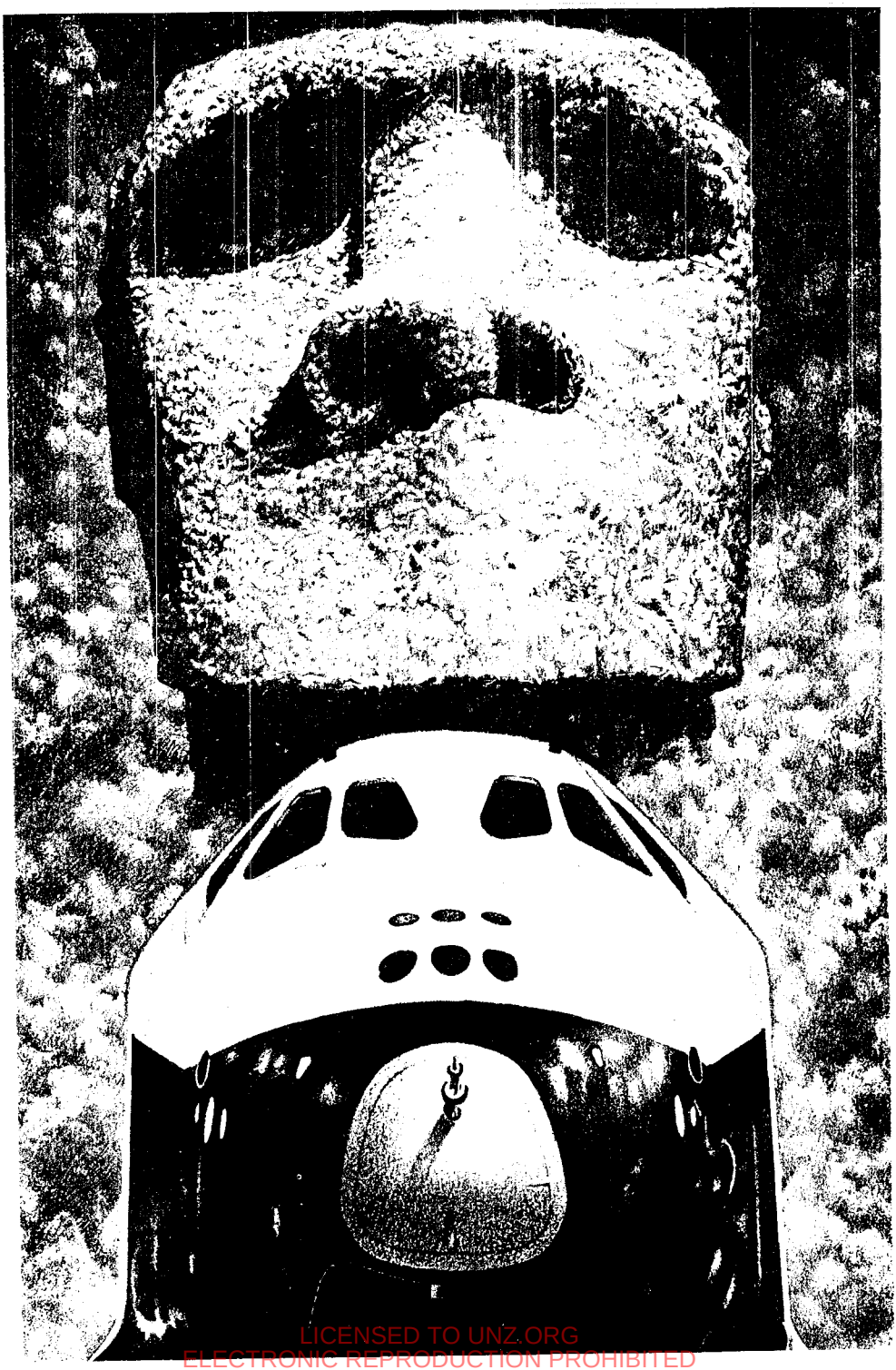

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"What?"

"We can't get a C-5 Galaxy into Mataveri."

"Hell, Matt, that runway's almost nine thousand feet long. Frank King got the *Atlantis* down there . . . and that's a very hot item."

"It may be a nine thousand foot runway, Red, but the Jepp charts—which is all we've got available on it—say it's only ninety-eight feet wide with no turnarounds at either end," the colonel from MAC explained. "C-5's have been restricted to runways a hundred and fifty feet wide. We can't turn them around on any runway narrower than that without turn-arounds. *Plus* the fact that there isn't parking space *off* the runway to put more than two of them at a time to unload them."

"Well, stick some landing mats aboard the first one to land, and we'll help you put down a turn-around," Red suggested.

"No dice. When we tried that a couple years ago at Dyess Air Force Base, we damaged ten tires, the landing gear pods, and the flaps. The C-5 is *heavy*, man. It just bends the hell out of steel landing mats."

"Have you got any answers, Matt?" Red wanted to know. "We've got one-fourth of our manned space capability sitting in the middle of the Pacific Ocean. How do we modify the plans to get her out of there?"

"Got a cement mixer or an asphalt machine?"

"I don't get you."

"Okay, listen, I've got three C-130 Hercules for you. One of them takes you and your contingency landing crew in, along with some of the equipment necessary to build an asphalt or concrete turn-around at both ends of the Mataveri runway. The second C-130 brings the rest of that equipment. The third is a flying fuel tank, carrying enough JP-4 to refuel the C-130's already there, and we run it as a shuttle back and forth to Santiago to bring in more fuel. Once we have turnarounds and larger ramps built, I can get the C-5's into Pascua according to plan."

"I knew you'd figure it out," Red told him with a smile playing over his face for the first time in hours.

"And, as luck would have it, I've got three Herks available that'll be into Ellington by nineteen hundred hours tonight, ready to take you and your crew to Easter Island by way of Panama, Lima, and Santiago." The Air Force Colonel paused for a second, then went on, "You got the construction crews available to modify that runway?"

"I'll get 'em."

"Suggest you try Commander Block of the Navy SeaBees at the Pentagon," Matt Hubbard suggested. "He's always been helpful to us here when we found ourselves between a rock and a hard place."

"Okay, I'll do that," Red replied, making a note to have it run through headquarters since he didn't have that sort of authority. He also made a note to check local Houston contractors as a second source in case he ran into too much DOD red tape.

"Uh, one thing, however, Red," Hubbard added. "I know Chile's part of the 1952 military assistance pact . . . if the Allende government didn't abrogate it back in the late sixties. And we've always got the Rio Treaty

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to fall back on. But are you sure I've got military landing rights in Santiago and Easter Island?"

"We've got somebody working on it in State. I'll check with them," Red promised. "Assume you have all the permissions required."

"Man, I hope you're right . . . "

Red Richardson hung up, leaned back in his chair, put his hands behind his neck, and tried to stretch to relieve the tension. In another ninety minutes, the crew from Kennedy would be arriving, and the Shuttle Down task force would be pulling itself together in Houston. He'd put a number of people to work digging out facts about Easter Island that might pose problems. He knew there were going to be a lot of problems.

The plot projected on the wall of Mission Control showed the delta-shaped symbol of the *Atlantis* sitting smack atop a speck named Easter Island. The longer he looked at that projection, the more pessimistic he got, the more he began to worry, and the more potential problems began to form in his mind.

"Damn!" he swore aloud. That island was literally the end of the Earth.

He didn't really know all the problems, technical and human, that were going to be tossed in his way by the remote nature of Easter Island. He would find out the hard way in the next few days.

Roger Service stared stupified at the headline on the early afternoon edition of the Washington *Post*.

"SPACE SHUTTLE DOWN ON EASTER ISLAND!" the banner head screamed at him in huge, black letters.

The story that followed wasn't much better.

Service cringed because of two little letters, "AP," that appeared at the beginning of the story following the Washington dateline. And the by-line, "by Alice Arnold."

Damn Laskewitz! Service thought savagely. He shouldn't have given the story to AP, especially to that bitch Arnold! Of all the sensationalist, anti-technology, anti-space, hyperthyroids running around trying to act like reporters and screaming about the dangers of technology, Alice Arnold was considered by Service to be the worst. Why did Laskewitz have to deal with her at all?

In his other hand, he held a scrap of paper torn off the teletype machine connected to UPI. Herb Haynes had written a short but accurate account of what was going on. Service didn't have a quibble when the media people chose Herb Haynes as their pool reporter to go to Easter Island with the first planes. He didn't like Haynes; he didn't really trust any newsperson. But Haynes was at least honest about what he wrote.

Roger Service knew he was going to catch pure, unadulterated hell from the Administrator once the Boss had seen the *Post*. He was just waiting for the telephone to ring.

It did.

"Public Affairs. Roger Service speaking."

But it wasn't the Administrator's office. A sharp female voice jumped out of the receiver. "Service? Alice Arnold, AP. I understand Herb Haynes is going with you people to Easter Island. Get me aboard, Roger!"

"Hi, Alice," Service managed

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weakly. "Look, sweetheart, we've got only limited space aboard the Air Force cargo plane that's going in there . . . and no seats or amenities for women . . ."

"Dammit, Service, I'll buy my own commercial ticket, then . . . but I'll tell my readers that your chauvinistic attitude . . . "

"Alice, we can't take the whole world down there . . . not when our budget's been cut to the bone . . . thanks to your harping about the waste of money on space . . . " The instant he said it, he knew he shouldn't have.

"Get me on your flight, or you haven't seen anything yet! Or do I have to call the White House to make you behave yourself?"

The last thing Service wanted was to get the Presidential Science Advisor involved. He was going to have enough trouble with the Administrator anyway. "I'll get you aboard, Alice. Just be in Houston tonight. Maybe you can make the meeting of the recovery team at six P.M. Houston time . . . if you get moving. I'll tell Laskewitz you're coming."

"How the hell am I gonna get to Houston in four hours? How did Casey get there? Can I hitch a ride on the same NASA plane?"

"Only if you want to ride in his lap, Alice. But he left in a T-38 about ten minutes ago. I'd suggest you quit talking and start moving."

"I sincerely hope that we'll be able to work out the many problems in this matter, Señor," Alfred M. Dewey said smoothly to the *chargé d'affaires*. "Please be assured that the United States' government is more than anxious to cooperate very closely with the government of Chile. It was most fortunate that Isla de Pascua has a new airfield large enough for the *Atlantis* to make a safe landing on. Your government's to be commended for constructing that aerodrome."

"The government of Chile is always happy to assist the United States, especially when it comes to the space program," the slim and dapper *chargé* replied smoothly. "Please sit down, and we can get most of the details arranged quickly." He indicated an ornate chair beside an ornate desk.

"I believe I explained the basic problem to you, Señor," Dewey went on. "My government will need the permission and support of your government to recover the Space Shuttle *Atlantis* from Mataveri Aerodrome on Isla de Pascua."

"And what will that entail, Señor Dewey?" the *chargé* wanted to know.

"The National Aeronautics and Space Administration has had contingency plans for such a thing for years," Dewey pointed out. "They've already set their operational elements in motion. We'll have to land at least two Lockheed C-5 Galaxy transports at Mataveri with several other aircraft carrying personnel and equipment. We'll have to bring in the Shuttle carrier aircraft, a Boeing Seven-Forty-Seven modifided to carry the *Atlantis* on its back. The Galaxy transports will bring in the necessary cranes to lift the Shuttle aboard the carrier aircraft. We'll depart leaving nothing behind to mar the beauty of your Pacific island."

The *chargé* was taking notes in Spanish. "How many people do you antic-

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ipate bringing to Isla de Pascua for this operation, Señor Dewey?"

"NASA tells me that seventy-five people will be required for the recovery operation itself, and we believe that there will be another twenty-five to fifty people involved in the form of news media, supervisors, and others to coordinate the effort."

"So you're planning for more than a hundred people, Señor?"

Dewey nodded.

"For how long?"

"NASA estimates forty-five days."

The *chargé* shook his head sadly. "Señor, Isla de Pascua has a total population of about twelve hundred people. There is a sharply limited water supply on the island. And there is limited food available because the nature of the island does not lend itself well to extensive agriculture. There is extremely limited electrical power as well—certainly far less than that required to support your operation. I think it will be impossible for the facilities available on Isla de Pascua to support more than a hundred people for almost two months."

"I . . . uh . . . I'll have to relay this information to NASA," Dewey replied hesitatingly.

"There is also no fuel available for your aircraft. They will have to fly in with enough fuel to return to Santiago or Valparaiso," the *chargé* added.

Dewey swallowed.

The telephone rang. The *chargé d'affaires* picked it up, spoke in Spanish for a moment, then handed the handset to Dewey. "It is someone from your space agency."

"This is Alfred Dewey," the State Department man began.

"Mister Dewey, Reed Richardson at NASA Houston. I'm glad I caught you at the Chilean Embassy. We've run into some problems planning the recovery of the *Atlantis* from Easter Island."

"So have I, Mister Richardson. But what is your problem?"

"According to the Air Force, we'll need to make some additions to the airport there in order to get their transport planes turned around on the runway," Richardson explained. "We've also got to arrange to pour some concrete pads to set up the crane to lift the *Atlantis* aboard NASA Nine-Oh-Five."

"Richardson, give me your number and let me call you back after I discuss this with the Chilean *chargé d'affaires* here," Dewey told him. He took down the number and then added, "I'll be right back to you, because we've got some other problems, too."

Hanging up, he told the *chargé*, "That was the man in charge of the *Atlantis* rescue operation in Houston. NASA will need to make some changes to the runway at Mataveri so the airplanes can turn around. And we'll have to pour some concrete foundations for the cranes . . ."

"Señor Dewey." The *chargé* was shaking his head. "This matter is becoming considerably more than just a simple recovery operation. The Chilean government has had to put severe restrictions on any construction or excavation activities on the island because of the extreme interest exhibited in Isla de Pascua by both scientists and entrepreneurs. It is our policy to maintain the island in its current natural environment insofar as possible, and we do not wish

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to see it turned into another South Sea paradise. We can and do welcome a limited number of tourists, but even the new Mataveri Hotel cannot handle many people."

He put his fingers together into a steeple and looked thoughtfully at the ceiling. "It is the intention of the government of Chile to be as cooperative as possible since we are signatories to the United Nations treaty covering rescue and return of astronauts and space vehicles. But this operation will require many people and a great deal of equipment. You will have to bring in food, water, fuel, living arrangements . . . in short, you will have to transport a significant amount of people and material to Isla de Pascua. The environmental and cultural impact may be tremendous. In addition, you will be bringing in military aircraft and equipment which, given the delicate situation in the South Pacific, might cause diplomatic problems for my governments. I am afraid that this matter goes far beyond the authority of the Ambassador here to grant the necessary permissions."

It would be more than that, the *chargé* told himself, since the Soviets were pressuring Santiago to either permit them to establish a leased base on one of Chile's Pacific islands or, barring that, to deny their use as military bases to any other nation, especially the United States. The Soviets were trying to build their naval power in the Pacific. And, for all he knew, this might well be a ploy on the part of the United States to establish the basis for a future military base on Isla de Pascua. There *had* been rumors . . .

He stood up, signifying that the meeting was over. "I shall have the Ambassador communicate with Santiago on this matter."

Insofar as Alfred M. Dewey was concerned, the meeting was *not* over, and he didn't stand up. "Señor, my government has a very expensive device sitting on the Mataveri runway. It amounts to one-fourth of our national manned space capability. We have a number of international payloads, bought and paid for, that will require rescheduling and perhaps reassignment to other launch vehicles. I would respectfully request the most expeditious handling of the matter, especially the permissions required. I have people waiting in Houston, and there're four Americans on Isla de Pascua awaiting rescue."

"Señor," the *chargé* replied gently albeit somewhat vexedly, "I will act as quickly as possible. However, it may take several days, communication being what it is. In the meantime, I am certain that your astronauts on Isla de Pascua are being treated with warm hospitality and that there is nothing to worry about that would justify such extreme haste."

CHAPTER FOUR

Next to the Mataveri control tower, the Isla de Pascua radio station building was probably the newest edifice on the island. But "new" to the crew of the *Atlantis* was something different than "new" to the natives of Rapa Nui. The radio shack was built from the volcanic rock of the island with very little wood or concrete in its construction. And even the concrete looked well weathered, leading Frank to presume that it hadn't been mixed or poured properly by skilled concrete workers. The build-

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ing itself at the base of the control tower housed the transmitters for the Isla de Pascua aeronautical radio beacons, plus the VHF tower transceiver and the *en route* aeronautical traffic control equipment. It also housed the various low frequency communications gear that served aeronautical and other purposes. And there were additional rooms, most of which hadn't been occupied yet and which were bare to the walls.

The young enlisted man of the Chilean garrison was visibly nervous at having the military governor there as well as Father Francisco and the four strangely-dressed American spacefarers. However, he attempted to behave as professionally as possible in turning on and tuning up various pieces of equipment and then attempting to reach Santiago in a stream of rapid-fire Spanish.

When contact was established, Obregón got on the microphone and gave a verbal report of what had happened.

Frank couldn't follow the conversation; he looked questioningly at his three crew members, and each of them replied with a silent shrug or shake of the head indicating that none of them spoke Spanish either.

"Governor," Frank finally broke in during a pause in the intense exchange, "once you've given your report, please ask them to get in touch with Reed Richardson, Mission Control, Johnson Space Center, Houston, Texas. See if they can arrange two-way communication for me. I must talk to him and explain the technical details he needs to know. And, Governor, if you're worried about the cost of the call, the United States government will take care of things."

Obregón thought about this for a moment, then engaged in more rapid-fire Spanish over the radio. After long minutes, the military governor replied, "They're attempting to make the telephone connection now. It'll take several hours, Mister King."

"Several hours?" Jackie burst out.

Frank motioned for her to be quiet. "Governor, have them get in touch with the American Embassy in Santiago and make the connection through the Embassy's diplomatic radio channel," Frank suggested.

Obregón nodded. "Mister King, you're a man who knows how to get things done."

You bet I am! Frank thought. Ten years with the Air Force and six with NASA had taught him how to handle red tape and delays. He was worried about the possibility of a nitrogen tetroxide leak in the OMS tankage. They were about a mile from the *Atlantis*, but they were downwind of her.

Finally, Governor Obregón reported, "They're making the connection through your Embassy."

The auditorium was jammed with the 75 people from the Cape who made up the contingency landing team, plus the others who'd joined the group—Casey Laskewitz and Joyce Fisher among them. Over the objections of Reed Richardson, Casey Laskewitz had admitted the news media. A row of television cameras lined the back of the auditorium, and Casey promised the reporters from the various media a full press briefing following the general planning meeting.

It was very fortunate for NASA that

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Casey Laskewitz knew every one of the media reporters on a first-name basis. "Herb, you made it; good! Walter, I'm glad you're here! Charley, just keep your shirt on, we'll get you some library footage after this meeting is over! Hi, Alice, your boss let you come after all, huh? Howdy, Frank, welcome back to Houston! How goes the special series, Hugh?"

Some meetings between reporters weren't as cordial, however. "Well, if it isn't Lois Lane herself," Herb Haynes remarked to Alice Arnold of AP. "Still looking for Superman?" The barb referred to the well-known fact among newsmen that Alice Arnold of AP would chase anything with hair on its face. Her aggressive approach to news gathering matched her aggressive approach to the opposite sex, said approach being far from feminine in nature but more like that of a black widow spider, a comparison she didn't know was part of her reputation.

However, of all the men she'd met, Alice Arnold had a thundering dislike for Herb Haynes, not only because he worked for the competition at UPI but also because he had her number and didn't hesitate to let the world know it. There was no friendliness in her voice when she replied, "Well, such a surprise to see you here, Herb. I thought you'd be doing your usual bit by sitting on your fat ass up in Washington and clipping from other people's stories."

The hubbub in the auditorium quieted down as Red Richardson clambered up on the low stage and stepped to the podium. "Ladies and gentlemen, let's get settled down here. This is a planning meeting for Shuttle Down. Have we got the rest of the people on the net?"

There was a small loudspeaker set up on the table on the stage. It was connected by telephone lines and microwave links to other locations where people couldn't get to Houston, hadn't had time to get there, or wouldn't be needed in Houston in order to bring off Shuttle Down.

Seeing a nod from the communications tech, Red spoke up, "Military Airlift Command? Matt, are you there?"

"Read you loud and clear," the speaker replied.

"Dryden? Hank, are you on?"

"We're here!" came the voice of Hank Hoffman from Dryden Flight Test Center.

"Marshall? George?"

"We're here," came the slight southern drawl from Marshall Space Flight Center in Huntsville, Alabama.

"Headquarters? Mike?"

"Headquarters here," came an echoing voice indicating that there was a large contingent gathered in the sixth floor auditorium at 400 Maryland Avenue. Probably everybody who was anybody had managed to get into that conference room, Red thought.

A technician waved to Red from the side of the stage. "We've just got Frank King on the line via radio link from Easter Island through the Santiago Embassy," the tech reported.

A ripple of excited sound ran through the room.

"Hi, Frank. You okay? Read us all right?"

There was a slight pause, then some static, then Frank's voice came through barely readable, "Connection isn't very good, Red, but we hear you. When you

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guys going to come and get us?''

''As soon as we can get this operation organized. Let's get started here. Everybody has the details. First off, transportation: Colonel Matt Hubbard, MAC. What's it look like in your shop, Matt?''

''We'll have three C-130's ready at Ellington in about two hours.''

''I'll need more airlift than that.''

''I know it. I'm getting a Pan Am charter Seven-Oh-Seven for the press and some of the contingency recovery team that doesn't get on those first C-130's,'' the Air Force Colonel replied.

''Uh, we've got a problem,'' Frank said from Easter Island. ''The *Atlantis* is still on the runway, so you've got about eight thousand feet of runway one-zero available. We can't tow her off the runway; they haven't got a tow tug here. You might get the C-130's in, but nothing bigger.''

''Matt, see if we can borrow a tow tug from Ellington . . . or somewhere . . . and put it aboard one of the first C-130's to land,'' Red said.

''What kind of tow tug do you need to pull the *Atlantis*?''

''It's got standard tow links on the front gear, and it weighs about a hundred and fifty thousand pounds right now,'' Frank's voice came through the static. ''But we'll have to tow it backward down the runway. We haven't got room to turn it around. Runway's only about a hundred feet wide.''

''What's the clearance under that Orbiter?'' asked Hubbard.

''Five feet at the nose gear,'' came Joe Marvin's voice from the audience.

''I don't think our Air Force tugs can get underneath,'' Hubbard replied.

''We'll lease a low tug from an airline at Houston International,'' Joe added.

''Okay, the first C-130 will be carrying a skeleton crew and a tow tug,'' Red Richardson said, changing the plans as quickly as circumstances dictated.

''How about a satellite communications ground station?'' Frank put in. ''Communications from here aren't the best in the world.''

''Okay, we'll check with Western Union or somebody. Dave,'' he pointed to a man in the audience, ''take care of it.''

''You guys are getting me loaded up pretty quick,'' Matt Hubbard pointed out.

''That isn't the whole story.'' It was Joyce Fisher. ''I just talked with my boss at State who's handling things through the Chilean Embassy. He tells me they face the following problems: (a) not enought water for an additional hundred or more people; (b) not enough food for them; (c) not enough electrical power to handle anything much more than another kilowatt of load; (d) no jet fuel available on the island; (e) no harbor available to off-load ships, so everything has to come in by air; and, finally, if that wasn't enough, there's no way that they can provide beds for a hundred people.''

''I had some of that data,'' Matt Hubbard broke in, ''but you've made my job one whole hell of a lot tougher. Red, we'll have to air-lift a complete community in there . . . and we'll have to get some support from Army to provide it.''

''Matt, can you handle that?'' Red wanted to know.

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"Negative."

"Headquarters, are you listening?" Red asked.

"Yeah," came the quiet reply.

"Mike," Red said, "have the Administrator get us some Army support on this. Can I count on you?"

"We'll get to work on it right away. We'll also ask the Navy if they can stand by offshore in case we need additional help in any way. Maybe they can get a boat ashore if there're no port facilities. Or maybe we can get an aircraft carrier so the Navy can fly stuff into Mataveri, too."

"Okay, Mike, coordinate with Joe Marvin here at Mission Control. I'll assume we're going to have food, water, shelter, and electricity courtesy of somebody in DOD."

"We'll get something," the voice from Headquarters promised.

"Another problem." It was Joyce Fisher again. "The Chilean government's being as cooperative as they can. They aren't adverse to the United States coming in there to pick up our Space Shuttle. But the Embassy has to check with Santiago on letting us bring in so many people and so much equipment. They're worried about the evironmental and social impact on Isla de Pascua, and they won't like the extensive United States Air Force presence on the island during the rescue operation."

"Tell them we've got several thousand pounds of poisonous rocket propellant sitting down here," Frank pointed out, his voice fading into static and then booming over the long radio link. "One leak, and the wind's blowing right toward Hangaroa. The military governor's very upset about it. And Doctor Esteban has absolutely no means to cope with mass exposure of the population to nitrogen tetroxide fumes."

"Excuse me," Joyce Fisher said. "Let me find a phone and call State." She left the auditorium.

"Tell the young lady from State she can add a couple more items to that list," Matt Hubbard broke in. "We'll have to fly in some runway construction equipment—and I may be able to work this through the Air Force, but otherwise somebody may have to convince the Navy to let the SeaBees do it—in order to build some turn-arounds at the end of the runway. We can't get a C-5 Galaxy turned around on a hundred-foot runway width."

"And we'll need the turn-arounds for NASA Nine-Oh-Five," came Hank Hoffman's voice from Dryden.

"Any concrete on the island?" It was George Tunney from Marshall. "We've got to pour footings for the stiffleg derrick and the tag line masts."

"No concrete." It was Frank from Easter Island. "The military governor says there's none on the island, and no equipment to mix or pour it."

"Okay, then we'll have to bring that in, too. George, the stiffleg is Marshall's show. You find us the concrete mixing and pouring equipment along with the Manitowock crane and cherry pickers you need. Check with Colonel Hubbard on sizes and weights so he knows what he's got to airlift."

"This's getting out of hand." It was Duke Kellogg, sitting in the front row of seats and watching his subordinate run the show. "Our budget won't handle all this."

"Any estimate on costs?" came the

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voice from NASA headquarters.

"Hell no," Red shot back. "We're just beginning to find out what *all* the problems are. Until we know how much this is going to deviate from the standard contingency plan, we won't have the slightest idea of what it'll cost."

"Where are the funds?" Kellogg asked.

"I don't know," Red admitted, "but consider the alternative: What would it cost to replace the *Atlantis* now that the production line's shut down and the jigs dismantled? And could we maintain our committments with only three-quarters of our launch capability? I doubt it. Until I hear otherwise, I'm going to get the *Atlantis* back from Easter Island. It's bound to be cheaper than a new Orbiter."

"Uh, Red," came the hesitant voice of Hank Hoffman from Dryden, the man who'd pilot the Boeing 747 Shuttle carrier aircraft, "I hate to bring this up, but I looked into the flight planning after Joe called me earlier. I can get Nine-Oh-Five to Easter Island with no sweat. But Nine-Oh-Five hasn't got the range to reach Santiago or Tahiti with the *Atlantis* on her back."

"What?"

"I can stretch the astimated range to about fifteen hundred nautical miles," Hoffman's voice replied. "The closest landing spot—and I mean the closest dry land, man—is Santiago almost two thousand nautical miles *east* against the southeast trade winds and prevailing easterlies. Remember, the winds blow in the opposite direction in the southern hemisphere."

"Damn," Red swore, not caring whether or not he was being recorded by several TV networks. "Hank, you've pointed out a problem. Okay, you've got the responsibility for solving it. You've got some of the best engineers and mechanics in the world there at Edwards and Dryden. If you can't figure out some way to cobble-up a mid-air refuelling rig on Nine-Oh-Five, then work out *something* to squeeze more range out of that bird. Matt, any problem along that line with your operation?"

"Negative. I'm using a C-130 as a tanker to fly JP-4 into Easter Island to refuel the others. When we get the *Atlantis* off that runway and build some turn-arounds, I can fly in KC-135's or even KC-10's. We're just going to have to plan every flight very carefully. But, Red, we looked into the possibility of flying boom air-to-air refuelling of our MAC Seven-Four-Sevens a couple of years ago, and it's a major modification that could take months."

Joyce Fisher came back into the room looking very distressed. Red saw her and asked, "Okay, where do we stand, Miss Fisher? Can we get under way from Ellington with an initial crew and a tug to get the *Atlantis* off the runway at Easter Island?"

Joyce Fisher was shaking her head. "No, I wouldn't advise it," she said, her voice shaking. "We have other problems, Mister Richardson . . . and I must talk to you in private about them."

"Hold it!" It was the strident voice of Alice Arnold from the back of the auditorium. "What's so important that the news media can't know about it, too?"

Joyce Fisher sighed. This was one the

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times she wished she'd gone to work for the Peace Corps instead of the Department of State. But the State Department job had seemed so much more challenging. Well, she found herself thinking, isn't this the challenge she wanted? "You can make a telephone call and find out anyway. And it'll be in the papers and on TV tonight . . . if it isn't already. Both *Pravda* and Radio Moscow are demanding the Chilean government intern the *Atlantis* and her crew."

"What?" Red exploded. And the room burst into an uproar.

When things finally quieted down, Joyce came up on the low stage, took the mike, and went on to explain, "I just talked with my supervisor at the State Department in Washington, and things are somewhat in confusion. The Soviet Union claims that the *Atlantis* is a military launch vehicle with a nuclear-powered anti-satellite weapon in her cargo bay."

"That's ridiculous," came Frank's voice from Easter Island. "Why, I'll let Governor Obregón look into the payload bay and verify for himself that we're carrying Landsat-XIII, a civilian Earth resources satellite."

"The Soviets are going before the U.N. Security Council and want the United Nations to send a commission down to verify their claims by having the crew open the payload doors so the commission can inspect the entire cargo," Joyce went on.

"But that's impossible," Red Richardson broke in. "Those payload doors can be opened only in the weightlessness of orbit. Or we have to fly in the special strongbacks and supporting jigs to permit them to be opened on the ground."

"The Soviets demand that nobody from the United States go near the *Atlantis* until a U.N. commission's had the chance to inspect it and verify the Soviet claims," Joyce said.

There was dead silence in the room for a long moment before Herb Haynes of UPI asked from the back, "Okay, so what are you going to do?"

Red Richardson knew he had to take the bull by the horns. He had, after all, been put in charge of Shuttle Down by Duke Kellogg. He wasn't aware of all the niceties of international diplomatic protocol or the big game of world power politics. But he knew what was really involved here. "As the person in full charge of the recovery of the *Atlantis* under NASA's contingency landing program, I categorically deny the Soviet claims. Any of the news media may look at the payload documents, plans, and so forth. You can convince yourself that I'm telling you the truth when I say the *Atlantis* is carrying Landsat-XIII in her payload bay. There's *no* anti-satellite weapon or any military space vehicle aboard the *Atlantis*. True, she was launched out of Vandenberg Air Force Base in California where military space launches take place, but we use Vandenberg for a lot of civilian launches just as military space launches take place at Cape Canaveral. We've used Vandenberg many times for Shuttle missions into polar or high inclination orbits, so this's nothing new."

"Okay, Richardson, so what are you going to do?" Alice Arnold's strident voice cut in.

Someday, I'll manage to put it to that

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broad! Richardson thought. He knew her from past Shuttle missions. She was a popular news reporter because of her biting, sarcastic style that seemed to amuse a lot of her liberal readers. Well, her biting and sarcastic style didn't cut any ice with Red Richardson. He reminded himself to have a word with Casey Laskewitz.

But he answered, "We have a situation caused by an in-flight emergency. We don't know what caused the malfunction, but that's not the prime issue. Frank King had to make a contingency landing on Easter Island under the most difficult of conditions, and he saved the *Atlantis* and her crew in the process. There's a lot of nitrogen tetroxide sitting in that Orbiter. The safety of the twelve hundred inhabitants of Easter Island demands we get down there as quickly as possible with the expert technicians and special equipment necessary to offload that nitrogen tetroxide and get it into safe storage containers. I trust that the Chilean government will permit us to do this to insure the safety of their citizens. That'll be the first flight leaving from Ellington Air Force Base. The rest of the Shuttle Down operation will be geared up and ready to go upon approval of the Chilean government. When we get to Santiago, we'll see what's happened in the meantime. Right now, I consider this an emergency with the lives of more than a thousand people at stake . . . and I'm not going to sit around on my butt and wait! I'll be on that plane, and I'll coordinate this operation from Santiago and Easter Island. All of you involved in the operation know what's expected of you. Don't come to me and expect me to solve your problems. If you have problems, solve them. Or call upon the best expertise you can find to get an answer. Just do what you're supposed to do. Joe Marvin, set up a communications center here at Mission Control to keep everybody in touch with everybody else. I'll check in with you *en route* to Santiago and also when we get there. In the meantime, I want the propellant unloading crew to get their equipment over to Ellington right now. Frank, hang in there, and we'll get your ship home yet."

And without waiting for questions from the press—he'd promised Casey he'd stay for a press conference following this planning session, but to hell with it now—he strode off the low stage, saying to Joyce as he went, "Come along, Miss Fisher. I think we're going to need you badly." His stomach was giving him hell again, and he was fighting back the tension hiccups that would have demolished him during the final planning meeting.

Casey stepped onto the low stage and spoke into the microphones. "I know I promised the media a press conference following this planning meeting, but Red Richardson's got his hands full . . . as you can plainly see. We've got the *Atlantis* crew on the net here, and I'll do the best I can to help you out by running a press conference here and now with the crew. Frank, are you still on the horn there?"

"Roger, Casey. We'll do the best we can to answer all the questions we have answers for right now," Frank's garbled voice came back.

"Okay, if we can get the Shuttle Down people on their way, there'll be

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room for the news media to come down front where you can set up your mikes and cameras close," Laskewitz went on. "Frank, hang in there for a minute until we can get things organized here. Then I'll field questions for you."

"Obregón says we're using up a lot of electricity," Frank remarked.

"Tell him we're going to bring him plenty," Casey shot back. "Chances are, we'll have to leave a lot of our equipment there because it'll be too expensive to airlift it back."

"Aren't you wasting taxpayer's money doing that?" It was Alice Arnold, of course.

"No, Alice, look at it this way," Casey told her, knowing her particular prejudices and philosophy. "Those people on Easter Island haven't got a lot of things we call necessities here. They've *always* had an energy shortage. Is it so terrible for us to leave them a couple of electrical generators in exchange for their hospitality in permitting the *Atlantis* to land there? Know what a Shuttle Orbiter costs these days? We're getting off cheap, thanks to Frank King's skill in being able to land the *Atlantis* there without any of the ordinary landing equipment."

Back on Isla de Pascua, the man whom Casey was talking about was listening to the noisy radio loudspeaker and feeling a bit embarrassed in front of the other three members of his crew. He picked up the old Astatic crystal microphone and said, "Casey, don't forget there're four of us aboard the *Atlantis*. I just happened to have the sidearm controller in my hand."

Hap grinned. "Yeah, Jackie and I sat there and took care of the white knuckle and sweaty palm department."

"Speak for yourself, Hap," Jackie snapped.

"You mean you weren't even scared just a little bit?" Hap replied sarcastically.

Frank saw that he was going to have trouble with these two. Hap knew how to get to Jackie's sensitive spots, and Jackie responded by reacting as anticipated. He reminded himself to have a word with both of them individually about it. In spite of the differences in personalities, he didn't need to have internal dissention in his crew right now, not under these circumstances. So he assumed his bird-colonel personality and snapped, "Hold it down, both of you."

Obregón, Father Francisco, and Doctor Esteban merely watched. And they remained quiet because, although they wouldn't admit it, they were a bit stunned by the fact that their little island and its radio station were part of a meeting taking place thousands of miles away. They listened.

Casey finally got things arranged in Houston, and his voice came through, "Frank, are you still on the line down there on Easter Island?"

Frank keyed the mike and replied, "Roger. But please call it Isla de Pascua or by its native name, Rapa Nui."

"Yeah, but nobody in America knows it by those names," came a thin voice, obviously from a reporter in the audience.

"Okay, we'll take questions one at a time for the crew of the *Atlantis*," Casey broke in.

"Colonel King," came the voice of a reporter from Houston using the

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pilot's military title which Frank wished hadn't been used at this point, "why did you pick Easter Island as a landing point? Why not the Hawaiian Islands?"

Frank sighed. "Look at a map or a globe. We launched due south out of Vandenberg. When we had the emergency, it was too late to fly back to the launch site, and we didn't have enough velocity to go all the way around the world back to the United States. Casey Laskewitz will show you the landing footprint of the *Atlantis*. We had a choice: Isla de Pascua or the Pacific Ocean. We're extremely fortunate that Isla de Pascua has a suitable airfield."

"How are you being treated by the Chileans?" another reporter asked.

"With the most gracious hospitality," Frank replied.

"Even with the current problems with the government of Chile?"

"I don't know anything about that," Frank snapped.

"I have a question for the military governor of Isla de Pascua." It was Alice Arnold of AP, although Frank didn't know her. "Governor, are you going to accede to the demands of the Soviet Union and intern the *Atlantis* and her crew until a United Nations' commission can inspect the payload?"

Obregón picked up the microphone. "This is Governor Ernesto Obregón. I heard some reference to a complaint by the Soviet Union a few minutes ago during the conference, but I know nothing more than that. I've been in touch with Santiago, and I've received no instructions concerning that matter. I want you to know that we've welcomed the American crew of the *Atlantis* to Isla de Pascua and that, unless I receive orders to the contrary from my government in Santiago, we'll adhere to the United Nations' treaty on rescue and return of astronauts and space vehicles."

"But will you imprison the crew if your government bends to the demands of the Soviet Union?"

Obregón laughed. The laugh was obviously heard in Houston. "My dear Señorita, there are no prisons on Isla de Pascua. Where could one escape to? Our island is only eighteen kilometers long and twenty-four kilometers wide. We're almost four thousand kilometers from Chile or anywhere else, for that matter. No, I don't intend to imprison our guests. Chile is a free democracy . . ."

Casey's voice cut in, "Herb, you had a question?"

"Herb Haynes, UPI. Colonel King, is there really any danger from the nitrogen tetroxide rocket propellants still left aboard the *Atlantis*?"

"Yes, sir, if there's a leak in the system," Frank told him honestly. "We don't know what caused the premature shut-down of our main engines, and we don't know if the cause of the shut-down was something that had an effect on the Orbital Maneuvering System rocket motors. None of the four of us are equipped to look into the matter. If there were fumes or a leak back there, we don't have the protective gear to survive such an inspection. There *is* a danger associated with the OMS propellants. But we've detected no leaks thus far, and every minute that goes by without a problem means that the danger lessens."

"Do you anticipate any problems in

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getting the *Atlantis* off Easter Island?" came the voice of another reporter.

"Technically, no. We'll get the equipment down here to do the job properly and safely. We may have to make a few additions to the airfield in order to handle the equipment."

"How about the political side of things?"

"That's not my concern, and I'm not qualified to talk about it," Frank said flatly. "I'm the command pilot of the *Atlantis*. I can answer your technical questions, but not the political or diplomatic ones."

"Colonel King, if the Easter Islanders could move all those stone statues around down there, why don't you ask them to use their psychic powers to get the *Atlantis* back to Vandenberg?"

"I have to assume you're trying to be funny," Frank snapped.

"Colonel, would you tell us what. . . ." And the voice coming through the ancient loudspeaker suddenly faded into cascades of static and whistles. The young Chilean radio operator sprung to the dials of the receiver and began to work with them. Nothing came from the loudspeaker except more static interrupted occasionally by burst of Morse code.

There was a rapid exchange of Spanish between Obregón and the technician.

The military governor sighed. "It appears that an important radio tube's gone bad," he explained. "We've had a replacement on order for months from Santiago, but it must come from Great Britain where the radio was originally made in 1942 for the Royal Air Force. It seems that we're out of communi-

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cation with anyone until we can get the reserve transmitter tuned up."

"How long will that take?" Frank wanted to know. "Any chance of restoring contact with Houston in the next few minutes?"

Obregón asked his radio operator in Spanish. The Chilean naval technician replied, and Obregón turned to Frank. "He says it'll take about two hours to get it warmed up and adjusted. It's even older than this surplus World War II RAF equipment. I think it was given to us by your Navy in the 1930's . . . and it isn't simple to use."

"Does this happen very often?" Lew wanted to know.

"Unfortunately, yes."

"You need a satellite ground station here," Hap remarked.

"We need many things on Isla de Pascua," Father Francisco remarked. "But we have managed to live reasonably well in peace without them."

"But suppose you had an epidemic? Jackie wanted to know. "How would Doctor Esteban handle it?"

"Where would the epidemic come from?" Esteban wanted to know.

"If it were serious, we'd have the proper medicines here within a week," Obregón explained. "After all, we have a jet plane flying between here and Santiago once a week. If all our long-range radio communications break down, there'll be a Seven-Oh-Seven here in a few days."

"Well, it seems we're out of contact with Houston for a while," Lew observed. "What do we do, boss?"

Frank had already made his evaluation of the situation. "For once in our highly-scheduled lives, we'll just have to sit tight and wait. Will you keep the radio station manned for incoming messages, Governor?"

"In this situation, yes, even though it may mean cutting off electricity for another part of Hangaroa to do it," Obregón remarked. "In the meantime, you're our guests, and we'll do our best to make your wait pleasant. It's not often that we get guests here. We're so very far away from everywhere. So now, my friends, we'll get in my jeep, and I'll take you to the Hotel Hangaroa. And Doctor Esteban has informed me that once you've had the afternoon to rest at the Hotel, there'll be a hula tonight to celebrate your arrival on Isla de Pascua." He smiled broadly and offered his arm chivalrously to Jackie. "Shall we go?"

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THE ASTOUNDING ADVENTURES OF ISAAC INTREPID

Mike Resnick & Lou Tabakow

On the day that gold topped $2,500.00 an ounce, OPEC refused to accept *any* currency for oil, demanding an ounce of gold per barrel of crude. America's already shaky economy began to crumble in earnest, and the President, dragging a 3% popularity rating behind him in the polls, called on Isaac Intrepid for help.

Pausing only long enough to put the finishing touches on *The End of Maternity,* a scholarly treatise exploring a unique cure for the population explosion, the great man threw himself into the breach, attacking the problem with all the resources of his prodigious brain.

He began by re-reading Roger Bacon's formulae, recomputing the equations, and integrating them with the number of angels that could sit on the head of one of Mortimer Adler's pins. When he added the average winning margin of Seattle Slew's Triple Crown victories, he realized that he had made his breakthrough.

"So why the long face, Isaac?" said his old friend, Dr. Torginson of Columbia, some time after the government was offering unlimited quantities of gasoline on the open market for a nickel a gallon. "The nation's in great shape, and you've won another Nobel for your collection."

"I haven't really cured our problems," said Intrepid grimly. "I've merely postponed them."

"But I know your formula works!" protested Torginson. "I've seen them transmute an ounce of gold into ten thousand barrels of oil at the laboratory you had them build in Los Angeles."

"Of course it works," said the great man. "But even a non-scientist knows that there simply aren't enough atoms in an ounce of gold to make ten thousand barrels of oil. I also made use of Los Angeles's greatest natural resource: smog."

"No wonder they all look so healthy out there," said Torginson. "But what's the problem?"

"In another six weeks at the most, Los Angeles will be totally out of smog. This," said the great man, a frown upon his magnificent brow, "is the time for action."

And, moments later, he was hard at work on his latest invention, Intrepid's Anti-Anti-Pollution Device, which would soon be installed in twenty million California cars.

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TOO HOT TO HANDLE

by Rick Cook

Sitting out in the middle of the New Mexico desert there is (or was until a few years ago) a large steel tank, a monument to our species' attitudes toward the risks and benefits of a new technology.

The tank, which is a little smaller than a railroad boxcar, was constructed during the mad rush to get a working atomic bomb to cover one end of a particularly grotesque spectrum of contingencies. When work started on the bomb, there was a rather large area of uncertainty as to just what would happen when the masses of plutonium were squeezed together. The highest probability assumption was that they would explode with an enormous bang. But the continuum ranged from nothing at all to initiating a chain reaction that would sterilize the planet.

The tank was built to cover the low reactivity end of the spectrum. It would contain the force of the conventional triggering explosion, and allow the scientists to scrape the plutonium off the inside so they could go back to the drawing board without the expense and effort of having to produce all new plutonium.

And what was the plan for handling the high reactivity improbability? The one that said the bomb would destroy all life on Earth?

There wasn't one.

The scientists working on the project regarded the universal chain reaction scenario as unlikely from the outset. They decided to cross that bridge when they came to it and ignored the possibility in order to get on with the job.

In any event, there was an explosion of properly satisfying proportions. As theoretical work went ahead on the bomb, it became apparent that both the pessimistic and "optimistic" predictions of reactivity were wrong, and the high probability outcome was in fact correct. (Of course it's also true that the night before the test, Enrico Fermi was

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taking bets on whether the explosion would destroy all life on Earth—much to the disgust of some of his colleagues.) When the first bomb was tested in New Mexico, they didn't bother to use the tank. It was left to rust slowly as an awesome and slightly forlorn relic of the birth of the Atomic Age.

To modern man, circa 1980, the awesome thing about the whole episode is the truly cavalier disregard of that low probability chance that the world would end on July 16, 1945, at Alamogordo, New Mexico. There was a war on, of course, and war tends to push humans to take risks they would otherwise shrink from. But beyond that, our attitudes toward the kinds of risks we are willing to accept has changed.

As the world has grown smaller, our backyards have become bigger. Technology shrinks the world with better transportation and communications at the same time that it expands our immediate surroundings by showing us just how interrelated everything is.

For the first A-bomb tests the New Mexico desert was sufficiently far away to be "safe." When we set off the first H-bomb just a few years later, we picked an isolated island halfway around the planet. Today we don't feel it is safe to test bombs anywhere in the atmosphere.

Experience and new measuring techniques have made us more sophisticated about the consequences of our actions. On both the scientific and personal levels we are increasingly aware of the basic unity of our world and the multiple effects of our actions. Our response is to focus on the risks, actual and possible, in a way that earlier generations never did.

This is nothing but common sense given the ever increasing power at our disposal. If you have the kind of power we now have, you'd better make it a habit to think your actions through very carefully.

As our power grows, we have to make decisions about how we will use it and what restrictions we will put on it. One of our difficulties is that we must make those decisions earlier and earlier as our technologies get more and more powerful. Increasingly, the question is not whether we should apply a technology, it is whether we should develop it at all.

Now we are entering an era when we must question the advisability of doing the experiments which will define a field at all.

For instance, there isn't much argument that we should continue to develop and test new pesticides in the laboratory, no matter how much disagreement there may be over their use. But there is a great deal of disagreement over developing a supersonic transport or a fast breeder reactor and even more disagreement over doing some basic recombinant DNA experiments.

The classic method of assessing the risks of something new is to try it out on a small scale and test the small scale version to its limits. We are getting to the point where that may mean testing some things beyond our ability to endure the consequences. These new enterprises may have enormous risks, so we don't dare test them exhaustively. But since we haven't tested them exhaustively, we cannot make accurate and unarguable assessment of the risks.

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Since we cannot make precise assessments, any attempt to test them exhaustively will face strong opposition and long delays. The resulting debate is bitter, interminable, and largely sterile.

The most obvious example of this process today is the question of nuclear safety, especially safety of nuclear power plants in the event of loss of coolant to the core. The possible consequences range from merely damaging the reactor to killing hundreds of thousands of people. Not all the consequences are equally probable, and some of them may not even be possible. The debate focuses on the relative probabilities and possibilities.

We have attempted to meet this challenge by doing very sophisticated simulations and computer studies of the problem. But simulations are always open to debate or questions about the underlying assumptions. Without experimental data it is very difficult to refine the model to an acceptable degree, particularly where important questions are concerned.

We could solve the issue once and for all by building some test reactors and deliberately cutting off cooling to the core under various conditions. But the worst case scenarios for cooling failure involve introducing more radioactive material into the environment than most atomic bomb tests. There is nowhere on Earth where such experiments would not pose a risk of undesirable consequences to the whole planet—particularly not if it is true that any increase in environmental radiation produces an increase in the incidence of cancer, a widely held belief in some circles.

An even more striking example of the difficulty of intelligently assessing risks from limited data is the debate over recombinant DNA research. The possible risks were so obvious that many of the pioneers in gene splicing turned the field into a national issue by calling for a moratorium on some kinds of work until the risks could be assessed and considered.

It's important to understand that these debates, or the intelligent parts of them anyway, focus on *risks*. A risk is the probability that a given undesirable outcome will occur. To estimate a risk you need to know two things: 1) Is this outcome possible? 2) How likely is it? The scientists who asked for a moratorium on some recombinant DNA research couldn't answer those questions, so they called for a time-out while they looked for acceptably accurate answers.

The point is worth emphasis because a lot of people confuse a risk with a danger. A danger is what you have when an undesirable outcome is both possible and fairly probable. There is a risk you will be killed in an airplane crash every time you fly. You're not in danger of dying until the engine falls off the wing.

There is another side to this question, one that usually gets lost as we go round and round about the possible risks of new technologies. That is, benefits we can gain from them.

In most cases what we are offered ranges from merely sizeable benefits to enormous and desperately needed benefits. We need mass-produced hormones and other sophisticated biologicals; we need dependable, inexpensive energy; we need food crops

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that fix their own nitrogen; we need a cure for cancer. There are hundreds of things these new technologies can give us, and we need them so desperately that the future of humanity may well turn on whether, when, and how we get them.

So far we have been able to do the necessary research and avoid the horror-show scenarios. But science is churning out discoveries at an ever increasing rate, and these keep getting potentially more powerful all the time. Atomic power may be safe, but how about anti-matter or cold-catalyzed fusion? If we keep on making new discoveries, at least *some* of our bad dreams are going to come close to reality. The whole process is rapidly getting too hot for us to handle.

What do you do when something is too hot to handle? Throughout human history the most common and effective strategies have been to get a longer pair of tongs or thicker insulation. In modern terms, distance and containment.

Distance as a protection started breaking down around 1945 with the development of long lasting pesticides and large amounts of artificial radio-activity. Today pure distance on Earth can no longer buy a sufficient measure of safety for some of the work we want to do. Containment has been more effective, but as the risks increase, containment must be made every more stringent. At some point the relation between added cost and added protection stops being linear, and you must pay ever increasing amounts for each small increase in protection.

The Calculus of Risks

The questions of risks and benefits may be new to science, but they are old to lawyers. In a classic article in the Harvard Law Review in 1915, five criteria were set forth to determine if a risk is reasonable or unwarranted:

1) The magnitude of the risk: How likely is it to cause harm?
2) The value or importance of what will be exposed to risk.
3) The value or importance of the collateral object—that which is to be gained by taking the risk.
4) The probability that the objective will be obtained by taking the risk.
5) The probability that the collateral object (objective) would have been obtained without taking the risk.

Lawyers sometimes speak of the "calculus of risks" in discussing their cases. You can sum up this calculus in the pseudomathematical formula:

$$\frac{B(P_r - P_w)}{MV} = \text{Acceptability Factor}$$

Where B is the benefit (collateral object), P_r is the probability of gaining it by taking the risk, P_w is the probability of getting it without the risk, M is the magnitude of the risk, and V is the value of what is at risk.

Obviously this is more metaphorical than mathematical, but the basic relationship holds at least broadly.

The sticky part of this formula in the cases we are considering is the denominator. We aren't sure of the value of M, and the value of V is very large. That means the payoff has to be huge to produce even a marginal acceptibility.

The magnitude, M, is hard to reduce because we don't really know what it

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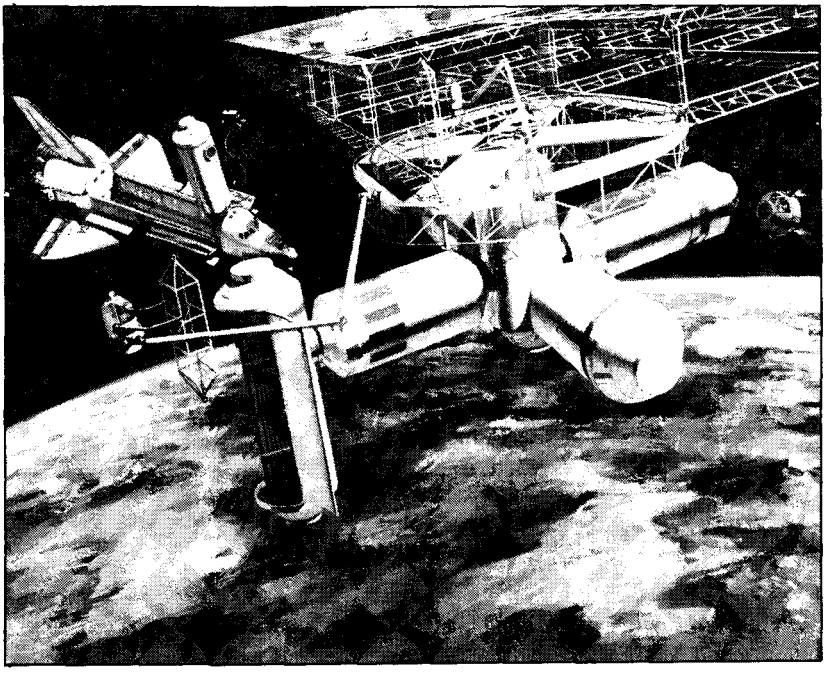
is. Typically, one of the purposes of the experiments is to find out. That leaves us with V, the value of what we are risking. If we can reduce that from "all life on Earth" to "some expensive hardware and maybe the lives of a few volunteers," the acceptibility of this kind of work goes way up. We can pursue lines of research that sane consideration would completely prohibit otherwise.

We can do this by moving work in risky or uncertain fields off the surface of the planet and out into space. There we will have all the distance we need and a degree of containment unattainable on Earth. There the most dangerous experiments we can now contemplate can be carried out with a degree of risk we can easily accept.

Space labs make sense in several ways. They make sense as part of the drive for space industry because their product information fulfills the stringent requirements for profitable production in space. They make sense from the standpoint of the problems posed by new technologies. They also make sense



ROCKWELL INTERNATIONAL PHOTO

Building a space station using modules brought up in the Space Shuttle. The scheme shown in this artist's conception uses men in space suits and special construction "jeeps" to assemble the station. Other proposed systems would use modules that only need to be joined with the Shuttle's material-handling boom, eliminating the need for jeeps.

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from a political/philosophical standpoint that we'll leave for last.

Anything that will repay the huge costs of space production is going to have to be either unique with no good substitutes, or incredibly expensive to make on Earth. Diamonds, for instance, probably don't qualify. Their cost is mostly the result of an artificially restricted supply and the expense of cutting and polishing them. However, the right kind of information is one of the most valuable commodities that humanity produces. Information that cannot be safely gathered on Earth is a unique product as well.

The benefits of space labs for developing new technologies are outstanding. With proper design, a space lab can provide an absolute guarantee that risky or dangerous experiments will not contaminate, damage, or destroy life on Earth. (Or as close to an absolute guarantee as we can get, anyway.) The work will be isolated from Earth by hundreds or thousands of miles of hard vacuum. Access to the facility will be limited in a way that no Earthly security system can match. The labs will be designed from the skin in for their role, and the designers will have far more control over their parameters than they do on Earth. The very nature of a space habitat means that fail-safe systems will be piled on fail-safe systems. If it is desirable, the lab can be located in a place where nothing will fall back to Earth even if the lab blows up.

Potential Projects

The ability of any industry, even a research industry, to sustain itself in space depends ultimately on economics. It has to create more values than it consumes, at least in the minds of the people who pay the bills. Are there any research programs which might repay the costs of taking them into space?

A quick scan of our present technologies not only says yes, it provides a number of obvious candidates. Here are some of my favorites:

Genetic Engineering

Genetic research and development is a prime possibility. The basic material is small and light, the returns are so huge as to be nearly incalculable, and the nature of the research objects means they can pose a threat if some kinds of work are done on Earth.

Probably the most spectacular short term payoff would be developing, and possibly producing, hormones, enzymes, and other biological materials we now must obtain by laborious and enormously costly extraction from human and animal organs.

Urokinase is a powerful drug for treating blood clots, but currently it costs about $1,500 a dose because it must be extracted from kidney material. Production is nowhere near the needed 500,000 doses a year. An anti-cancer drug called L-asparaginase costs about $10,000 for enough to treat a single patient. There are other things, like interferon, or the human growth factor for treating dwarfism, or the clotting factor for treating hemophilia victims, that could be produced cheaply and in quantity by recombinant techniques.

The recombinant cultures could be developed in space and thoroughly tested there. Those compatible with the Earth environment could be returned here for production, and the others could be produced in orbital factories.

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Besides safety, there are several other reasons why we might want to produce recombinant material in space. One of them is the risk of reverse infection. Recombinant cultures are almost always less efficient than their unmodified relatives since they have to use extra energy to produce the products the foreign genes code for. If such a culture is contaminated by wild microorganisms, the carefully developed hybrids can be supressed by differential competition. This may not be as threatening as having a dangerous hybrid escape, but it is expensive and frustrating.

Another advantage to space production is that most microorganisms are more efficient under no-gravity conditions. Convection currents and gravity don't act on them, so each cell gets more nutrients. (Microorganisms are small enough to be moved around by Brownian motion in a liquid medium, so their immediate surroundings don't go stagnant.)

Extraction of the end products can be done more efficiently as well. One of the most sophisticated and precise extraction techniques we have is electrophoresis, but on Earth you need some sort of supporting medium to counteract gravity. We generally use filter paper, or a gel for really fine work. In space there's no problem with gravity, so we could apply electrophoresis directly to liquids. That makes it much more efficient and turns a lab technique into a commercial-lot proposition.

We could also produce special strains of microorganisms for industrial and agricultural purposes and thoroughly test them before releasing them into the biosphere.

In September, 1966, Analog ran a story by Hal Clement called "Mechanic" that dealt with genetic engineering. The plot turned on a crash of a large hydrofoil caused by a strain of artificially produced iron-concentrating bacteria. A colony of the bacteria got smeared on one of the hydrofoil's struts, attacked the metal, and caused the strut to fail. A strain of bacteria that could extract iron would have a lot of uses, but as the story pointed out, it would also need some built-in safeguards.

Microorganisms that could reduce the viscosity of crude oil would give new life to pumped-out oil fields, but you wouldn't want these agents working on the asphalt in your parking lot. Strains of bacteria tailored for methane production would let us replace natural gas with biogas, but you definitely would not want them growing in your digestive tract.

The problem of producing new organisms via genetic engineering is twofold. First you have to tailor the organism to do what you need done, and then you have to disable the organism so it won't do it outside its planned environment. This isn't necessarily difficult, but you do have to test thoroughly to make sure that natural selection won't undo what you have done. The job of space labs would be the development and testing of the organisms.

Not all genetic engineering will have to be done in space. Better than ninety-nine percent of it will be done on Earth using conventional laboratory precautions. But having bioengineering labs in space would give us an important option in cases of special danger or unassessable risk.

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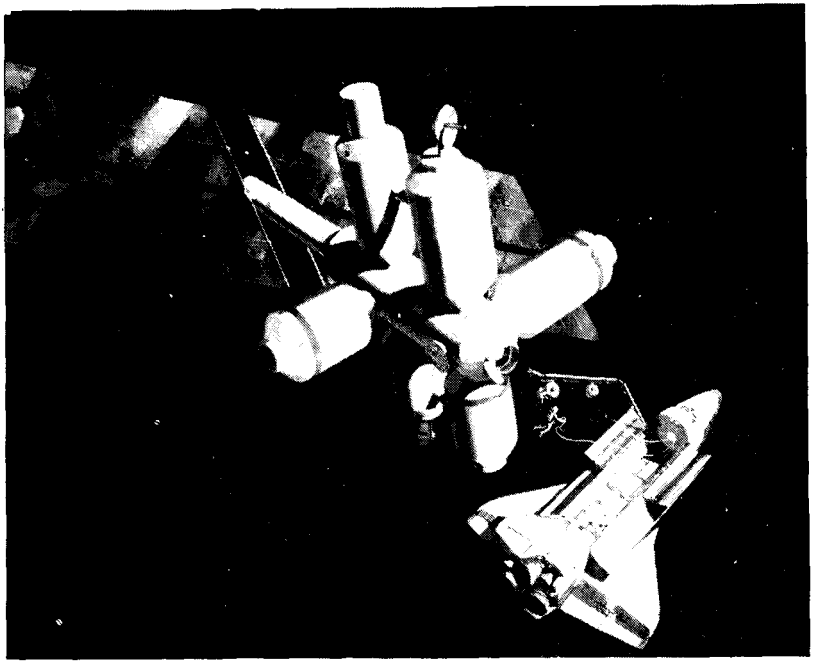

NASA PHOTO

Cargo that must be protected from space can be transferred from the Shuttle to the station in pressurized balloons, as shown here. This technique would be especially valuable in handling potentially dangerous material destined for orbiting labs. The balloons would be sealed at the facility on Earth where the material was produced and not opened until they were in the containment areas of the labs. This gives an additional level of containment in case of accidents in transit.

Space Zoos

The last death from smallpox occurred in September, 1978, well after the World Health Organization reported the last case in the wild.

The victim was Janet Parker, a photographer at Birmingham University in England. She contracted smallpox from a culture kept for research purposes in a university laboratory.

Cultures of dangerous organisms are important tools in medical and biological research. Any organism which can cause illness in a human being has something to tell us about the nature of our bodies. For example, to be dangerous, organisms must have a way of getting through our immune defenses. By understanding how they do that, we can learn more about our immune systems and their workings.

On the other hand, a dangerous culture poses a risk. This is especially true of a disease like smallpox which is highly contagious and which most people no longer have antibodies against.

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Some of the diseases which are most interesting are extremely serious but geographically limited in the wild. Some of them we still can't cure, and many of them probably wouldn't be recognized by the average doctor in time.

About five years ago an Arizona cowboy somehow contracted bubonic plague while working the range. It took the doctors nearly two weeks to figure out what was wrong with him, and he nearly died in the interim. Mind you, plague is a disease that responds readily to modern antibiotics (although not the common ones), and there is a case of plague every three or four years among Arizona's Indians. Since the doctors didn't know what they were dealing with, they wisely took extreme precautions against infection. If they had been less careful, if the disease had been less well-known, or if it was something that was more difficult to cure, the whole state could have had a problem.

If the state had a problem, it would have needed cultures of plague bacteria quickly—to produce vaccine.

Countries with major medical research programs have microbiological maximum security zoos where dangerous organisms are studied. The United States' zoo is at the Center for Disease Control in Atlanta, Georgia. At the present time, the CDC and similar facilities in London, Tokyo and Moscow are the only places in the world that are supposed to have smallpox cultures.

The safest place for those cultures is in space. We can keep and study them there with far less danger than anywhere on Earth.

Nuclear Research

If we are going to make manned flights to the outer planets, we are going to need a nuclear rocket or something like it. Currently our nuclear rocket program is dead, in large part because there was no way to test the engines without releasing some radioactivity into the atmosphere. Anything that puts out radiation is very unpopular with Congress these days and isn't likely to get funded.

Since nuclear rockets are space vehicles anyway, the logical place to develop and test them is in space. That way we can have the benefits with almost no risk to Earth.

A similar situation exists with new types of nuclear power reactors. There are a lot of designs and concepts that haven't been explored adequately, and some of them look extremely promising. Considering the increasing restraints placed on atomic work on Earth, it might be cheaper to build and test new reactor designs in space. We could get the experience we need with new designs with a minimum of risk.

If we wanted to, we could test our conventional designs to destruction off Earth to find out what does happen. That information alone would be worth billions.

It would probably take an elaborate series of tests on Earth and in space to get the answers we need.

Test reactors could be built in space and their cooling interfered with. The results of these tests could be used to refine tests done on Earth with dummy reactors where chemical reactions duplicate the effects of reactor failure. The results of the Earth tests could be used to refine the next series of space tests. Run through this cycle enough times and you can achieve any desired degree

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of accuracy.

This is more complicated and more expensive than it sounds. The big engineering challenge would be to design a reactor that would respond in space the way a conventional reactor does on Earth. Hence the successive approximation technique.

For instance, what do you do about the absence of weight in space? The obvious answer is to imitate it with centrifugal force. But that raises the problems of allowing for coriolis forces, the difference in "gravity" between the top of the reactor and the bottom, and several other related things. It would undoubtedly take several successive designs to get the answers we need.

Our major need is to know what goes on inside the reactor during a failure. The interaction of the results of a meltdown with groundwater, wind, soil and so forth are important in assessing the ultimate results of a catastrophic reactor failure, but these processes are better understood and easier to model satisfactorily. If we know the characteristics of what comes out of the reactor—if anything—we can predict the interactions with the environment.

Other Possibilities

As we develop new technologies, there will be other risky experiments to be made. We may want to explore the properties of large masses of antimatter—say a gram or so. The CERN nuclear research facility in Geneva was able to store a small quantity of antimatter for 85 hours in magnetic confinement. If we are going to work seriously with antimatter, we're just about going to have to do it in a vacuum and far, far away from anything else.

A much more speculative possibility is developing cold-catalyzed fusion power: hydrogen fusion without plasmas, electron beams, super-magnets, or any of the other complex gadgetry that has bogged down research in the field for the last 35 years. (See the Feinberg reference in the Bibliography.)

We have known since 1957 that if you replace one of the electrons in a molecule of deuterium with a heavier negatively charged particle, say a muon, the hydrogen nuclei will fuse spontaneously. The muon acts as a catalyst and can cause fusion reactions as long as it is in contact with deuterium. However, muons only last about two microseconds. That's why the seas don't boil from catalyzed fusion power.

If we can discover a reasonably stable negatively charged particle at least as massive as a muon, we will have the potential for useful catalyzed fusion. There is no really good reason to believe such a particle does not exist, but theory says, if there is such a thing, it will require enormous energies to produce. We are only now beginning to build particle accelerators able to reach the energy levels needed to create these hypothetical super-muons.

Within the next decade or so we'll know whether super-muons exist. If so, we will still have a lot of development work between us and our first cold fusion power plant.

We had better do that work where there is no possibility of super-muons coming in contact with deuterium —which means keeping them away from all water, since there is a little deuterium in almost all water. Potentially, these particles are even more dan-

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gerous than anti-matter. True, they won't affect anything besides deuterium, but unlike anti-matter, they won't be destroyed in the reaction. They will keep on catalyzing fusion as long as they are in contact with water.

Design Considerations

Broadly, there are three possible locations for space labs. The first such facilities will probably go into near-Earth orbit (NEO) since this is the easiest and cheapest part of space to reach. This is a lot better than doing the work on Earth, but it doesn't offer maximum safety.

Near-Earth orbits are deep in the planet's gravity well and material in those orbits will eventually be pulled back into the atmosphere. Witness Skylab. In the event of an accident which destroys the station, debris would fall back to Earth. Small items would probably burn up on re-entry, but that isn't much help if you're dealing with radioactives. If especially dangerous biological material was involved, NEO might not be considered secure enough, either.

Working at the L4 or L5 points would be considerably safer. Material escaping into space at one of these points would tend to stay there, held in place by the balance of the pull from the Earth, sun and moon. The biggest problem with the L4 and L5 locations is that they are considerably further out, and the expense and effort of getting there is greater. They would be the locations of choice for programs involving radioactives, such as nuclear rocket research and experimental reactor design.

Using the L points for space labs doesn't close them off to other uses. These "points" are actually large areas that are more-or-less tadpole shaped. Anything we put in them is going to have to be armored against radiation from solar flares and hermetically sealed anyway. A combination of good "zoning" and careful design would minimize any potential problems.

The moon and its immediate vicinity offers a third possibility. If a lab is put in lunar orbit, anything that escapes will end up on the moon. That might be unaesthetic, but not dangerous. For experiments that need gravity, the moon's surface would be the location of choice.

Of the three locations, the moon and the space around it is the hardest to reach. It will probably be the last to be exploited.

For the rest of this century, the major vehicle for getting men and equipment into space will be the Space Shuttle and its follow-ons. This will pose constraints on size and weight of items that can be taken into orbit. In the long run, these won't be too limiting. One of the projects already on the Shuttle's experimental program is work on building structures in space. The project can be adapted to building space labs if need be.

In the short term, any structure put into space will probably be composed of modules built on Earth and assembled up there. Most likely they will be adaptions of designs already on the drawing boards.

One design that has a lot of potential for adaptation is Spacelab, the European Space Research Organization's modular laboratory design that fits into the Shuttle's cargo bay. Available modules include a series of cargo pallets, a short manned module, and a long manned

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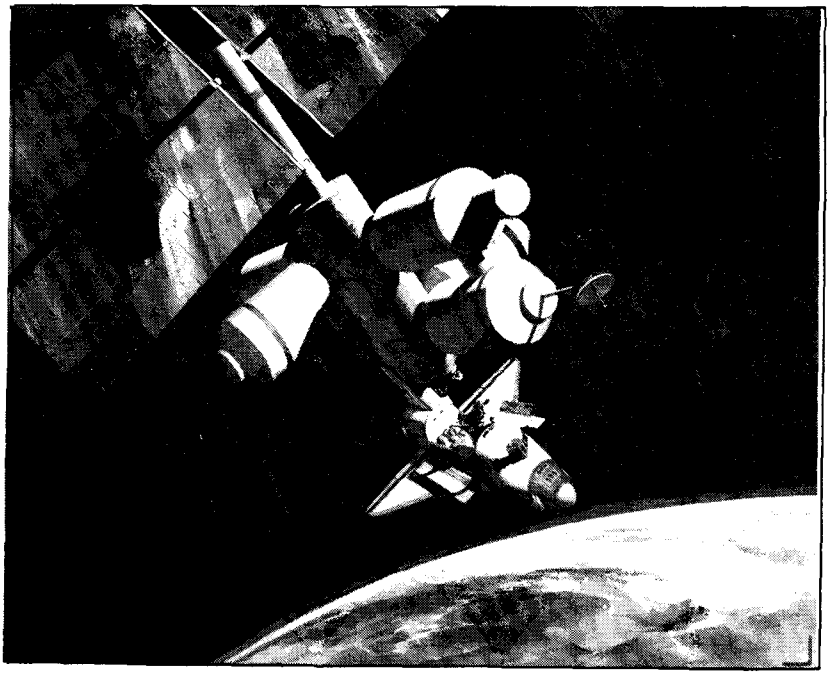
module which is seven meters long and four meters in diameter. A series of biological experiments is already being planned for one of the flights of the long module.

In addition, North American Rockwell, the prime contractor for the Shuttle, has done a series of studies over the last decade on building space stations from Shuttle-ferried modules. The cargo bay on the Shuttle can carry a payload up to about 18.5 meters by 4.5 meters in diameter, so the modules could be about twice as long as the long Spacelab modules.

Probably the quickest and cheapest way to build an orbital lab would be to adapt the Spacelab modules. Purpose built space station modules would undoubtedly come later.



ROCKWELL INTERNATIONAL PHOTO

A Space Shuttle maneuvers to hook to the lock of a modular space station. A design such as this would provide enough room for experiments that are too risky to be done on Earth. If desired each of the modules can be sealed off from the central life-support and power module. One proposal by Rockwell suggests that the lab modules would be set up and stocked on Earth and brought back for resupply and reconfiguration. This has advantages, but it probably would be too risky for many kinds of experiments. Note too that this station is in a low-Earth orbit. This is much safer than working on the planet's surface, but really dangerous experiments would probably have to be done even further out, perhaps at the L4 or L5 points.

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The Rockwell concept envisions a central core containing power supplies and life support systems. The modules for living and work would radiate off from this. Since Spacelab isn't designed to function away from the Shuttle, the Spacelab station would also need a power and life support core.

One of the most intriguing Rockwell studies calls for using laboratory modules that would literally plug into the life support core. The modules would be prepared on Earth, carried up to the core in the Space Shuttle or a follow-on vehicle, and attached. They could be brought back in the Shuttle later for resupply or reconfiguration. This gives the maximum flexibility at the lowest dollar cost, although it would be somewhat less secure than a lab that stayed in space.

Seven meters by four meters isn't much space by Earthly standards, but Skylab showed us you can use space much more efficiently in zero-g. For one thing, "eye-level" means something quite different when you can float to a convenient height.

Compared to a groundside facility, the orbital labs will be pretty spartan. Only the dangerous parts of research programs will be carried out there, and everything else will be done planetside. The labs will be linked to their parent facilities by elaborate communications nets and such functions as data analysis will be handled on Earth. Every possible ounce will have been shaved off the payloads and not so much as a pencil will be sent up if it can be spared.

Research programs will be mapped out carefully and aimed at getting specific answers as quickly as possible. The scientists will probably work to schedules as tight as those imposed on the Skylab astronauts.

The first space researchers will work very closely with their colleagues on Earth. They will probably be glorified lab technicians, carrying out experiments under the supervision of Earth-bound scientists. Of course, they will be the most highly qualified and best trained group of lab technicians the world has ever seen. The prestige involved in getting a space post will be great, and the competition for slots on the labs will be ferocious.

The size of the labs will vary with the function. All of them will be capable of many kinds of experiments. It would be most economical to gradually construct a few large space stations for research, but dangerous projects require small facilities to spread the risk. The first labs will probably house three to six people and would weigh in the neighborhood of 40 to 60 tons on Earth. Some of them will never get any bigger because the work is so risky. Others may eventually house 100 or more workers.

This is likely to produce some rather interesting side effects. The work will be highly structured and the living conditions pretty crummy, but intellectually it will be the promised land. All the non-scientific pettifogging will be done on Earth. Up in space will be a community of first class brains in a variety of fields who will be in constant formal and informal communication. (Research facilities will be close together in each area of space to facilitate resupply and mutual aid in case of trouble, so there will be a low-power radio

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net to keep everyone in touch.) That kind of intellectual ferment and cross-breeding is the stuff of which breakthroughs are made. We can expect to see a lot of serendipity coming out of space.

The problem of shipping potentially dangerous material into space will require some special thought. In the case of genetic engineering the problem won't be too severe since the recombinant work will be done on the satellites. Radioactive material poses a more serious problem, but this is one area where we already have a lot of experience. For over fifteen years the United States has been sending radioactives, primarily plutonium, into space as the active elements of the SNAP series of isotope power sources. We have found ways to package such material so it will survive any kind of spacecraft accident from an explosion on the pad to reentry.

In 1968 a Nimbus weather satellite with SNAP 19 on board crashed into the Santa Barbara Channel off the California coast when the launch vehicle malfunctioned. The generator and its cargo of plutonium was recovered intact from the sea floor a few months later.

Will We Do It?

The benefits we can derive from space labs for dangerous work are immense. In some cases they would make the difference between exploring new technologies to reap the rewards and passing them by as too dangerous. In other cases they will make it possible to do things quickly and expeditiously that we would only do slowly and hesitantly on Earth. Within two decades of the first launching, these labs will probably be seen as essential in the same way communication satellites are today.

Of course we will purchase these benefits at a cost. The expense of building and launching labs into space will run into billions of dollars. Given the present attitude toward space exploration, will they ever be built?

Probably, but they will not be our first priority in space. The first space labs will be for research into the nature of the space environment, astronomy and other "space" sciences. Presently there are no plans to launch labs for the sole purpose of doing dangerous work.

Yet once we do launch them, we will find the benefits will go far beyond the obvious results of the research programs. One of those benefits is the political/philosophical one alluded to earlier. In the long run it may be the most important benefit of all.

Increasingly, the most worrisome questions in our political life have scientific overtones. The questions are worrisome because we don't have the information we need to resolve them. We are stuck in the middle, and reasoned debate gives way to bickering and hysteria.

Again, the best current example is the debate over nuclear power. The preponderance of opinion is that the nuclear power plants are safe and cost-effective, but there is no real consensus because there are too many unanswered questions. The present situation is satisfactory to no one. Neither side can really muster the support it needs to prevail, so the infighting, redesigns, lawsuits and protests drag on. Better information wouldn't convince everyone, but it would convince enough people so we could lay the issue to rest and

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go on to something else.

A similar debate rages over pesticides, food additives and other chemicals. Largely it is a debate over cancer. Again, neither side is able to win a clear consensus because of the dearth of information. If we knew more about cancer, we could determine what, if any, are the acceptable dose limits for these chemicals.

These are the sorts of questions that potentially dangerous research can answer for us. Without that research we will spend an increasing amount of time arguing them. With it we can reach decisions satisfactory to most of us.

Considering the cost and complexity of the modern political process that may be the biggest economic benefit of all.■

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AN12

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A LINGERING DEATH

By Timothy Zahn

As John W. Campbell once observed
"You can't do only one thing."
And the side effects of a process
are not always immediately obvious.

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The wall surrounding the compound was tall and stark, and while undoubtedly efficient in its job of keeping the natives out, it was also quite ugly. From his office high in the administration spire, though, Raphael Hammond, Director of Contact Appraisal, could see over the wall and into the wide streets of the Jemnisi city beyond. Age and rank have their privileges, he told himself, as he stood and gazed out the tinted window.

It was just after noon, local time, and the number of pedestrians had doubled in the last few minutes, their red and blue tunics in sharp contrast to the white buildings and greenery of the many terraces. The Jemnisi were more advanced than Earthmen in many ways, but Hammond was thankful they had never developed the mania for skyscrapers that had ruined the potential beauty of so many cities on Earth and the Colonies.

Behind him the door opened and he turned as Dr. Floyd Caslon strode into the room. "Ham, I've got to talk to you."

Hammond waved at the pile of reports on his desk. "If it's a complaint, it'll have to get in line," he joked.

Caslon ignored the attempt at a light tone. "It's no complaint, and it can't wait." He dropped into a chair, his face unusually serious.

Hammond sat down and matched the other's expression. "Shoot."

"First let me remind you how similar the Jemnisi are to humans, especially on a biochemical level," Caslon began. "Same cell structure, basic DNA coding, amino acid combinations, ATP-ADP cycle, et cetera. Virtually all organs are similar, too."

"I know all that. I read the reports."

"Okay. Now remember that we've got their life span down as about a hundred years, or 'cycles,' as the word *hliss* was translated."

"Which is about human norm, too, since their year's only a shade longer than ours."

"Right," Caslon nodded, "which is reasonable given our similar physiology. Well, we were wrong. A *hliss* is a Chinese-type zodiacal cycle and lasts eighteen years."

Hammond sat up a bit straighter in his chair. "Are you trying to tell me they live eighteen *hundred* years?"

"That's the number *I* got."

"That's ridiculous."

"You're telling me. Ham, I just got wind of the translation error a few days ago and have been running around like mad nailing this down. There's no error. These people live nearly two millennia."

"Oh, my stars." Hammond stroked his graying sideburns, thoughts racing furiously. "Floyd, do you see the implications of this?"

"Most of them, I think. You're sitting on a potential bombshell, for sure."

"Yeah. All right, the courier shuttle leaves for Earth tomorrow morning. We're going to pretend this conversation hasn't taken place yet."

"You're not telling Earth?"

"Not until we have more facts. I want you and your staff to drop everything and get to work finding out exactly what makes them live so much longer than us. Is it the climate, the food, the radiation levels, or is it something within the Jemnisi themselves?"

"That's a pretty tall order."

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"Hang on; it's still growing. I need at least a first approximation of your answer in time for the next outgoing courier."

Caslon's jaw dropped an inch. "Two *months*? You've got to be joking."

"I wish I was. Look, if this planet turns out to be a solid-state Fountain of Youth, we're going to have hell's own time keeping people away from here. This culture's not ready for that yet."

"But the Initial Contact Restriction won't be up for another year. No one but us can land till then."

"Of course not. So they'll pressure the Senate to lift the ICR, or else just land illegally. But they *will* get here. If, on the other hand, it's *not* the environment, Earth will want to know what in the Jemnisi physiology is responsible."

"That one might be impossible," Caslon frowned. "We know next to nothing about them, medically, and most of our tissue samples are too old now for good picoscopic study."

"No chance of getting more, I suppose?"

The frown deepened into a scowl. "Not likely."

"Then do the best with what we've got. But hit the environment angle first. The last thing I want at this stage is hordes of immortality-seekers descending on Jemnok. Proving it's not the planet itself would help enormously."

"Right." Caslon stood up. "I'd also suggest you drop one word from your vocabulary."

"Which?"

" 'Immortality.' Too much emotional content."

"Good point. Okay, file your work under 'Lifetime Extension Studies.' "

Caslon grinned. "Very innocuous. See you later."

Hammond sat where he was for a few minutes after Caslon's departure, mentally tracing out some of the possible consequences of this new discovery. The situation looked stickier with every pass he took at the data, and finally he gave up the effort as unproductive. More facts were needed; until then too much imagination could be a handicap.

Standing up, he walked over to the window for one more look at the city before returning to his desk. Pushing aside the half-dozen microfiched reports awaiting his attention, he turned on his terminal and called up all available medical data on the Jemnisi.

Caslon's "next to nothing" had been relative to knowledge of human physiology; the Jemnisi file nonetheless contained an impressive mountain of facts and Hammond contented himself with reviewing the high points. Human and Jemnisi cell structures were indeed virtually identical, though an extra chromosome pair in the Jemnisi cell implied that some of the enzyme chemistry was likely to be different. The heart, liver, and kidneys were identical in form and function to their human counterparts. Other major and minor organs had received less study, but so far also seemed identical.

More work was definitely needed, but, as Caslon had implied, that was going to prove awkward. The Jemnisi had shown an extreme aversion to human medical examination, and it had taken a large slice of cajolery by Hammond himself to break down their resistance. Even then, the subjects had

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been members of the Supreme Ruling Council itself, who had volunteered rather than order other Jemnisi to submit to the tests. Hammond had no great desire for a rematch with the racial modesty, but the stakes were suddenly becoming worth the battle.

For the moment, though, there was nothing he could do. Turning off the terminal, he switched mental gears and slid the first report into his fiche reader.

Six weeks later, Caslon called it quits.

"Jemnok's ecosphere is just as complicated as Earth's with just as many types of bacteria, viruses, and exotic chemicals floating around," he told Hammond. "Given we don't even know what we're looking for, we could be at this until the quasars burn out."

Hammond nodded. "I more or less expected that. Well, I'm meeting with the Council Delegation in a few minutes. Maybe it's time we just asked them point blank about it."

"Hmm. I was going to suggest hitting the Delegation, too, but I was thinking more along the lines of subtly worded questions designed to gain information without them knowing it."

Hammond shrugged. "I know that's the traditional method, but why bother? I think we'll get better results if we're honest with them."

Caslon started to reply, but was interrupted by Hammond's intercom. "Sir, the Jemnisi Delegate-General and her party are here."

"Send them in, please."

"Want me to leave?" Caslon asked.

"No. You'd see the tape of the meeting later, anyway—you might as well be here in person."

The door opened and three Jemnisi entered the office.

Hammond never ceased to enjoy watching Jemnisi in motion. All of the natives, men and women alike, moved with a grace and suppleness Hammond had only seen before in professional dancers. Slender and of only human-average height, they carried themselves with the dignity appropriate to a race many thousands of years older than mankind. These particular three—two females and a male—were no exceptions.

"Welcome, Kili, Firnimi, and Afult," Hammond said in formal Jemnisi style, naming them in order of rank. As usual in the planet's matriarchal society, the single male—Afult—came last, his red tunic bright against the quieter blue of the females' garb. To even the most perceptive human eyes Jemnisi sexes were, when clothed, virtually indistinguishable, and Hammond strongly suspected that the red-blue tunic convention had been adopted for the convenience of the Earthmen. It had certainly helped avoid many awkward moments.

"We greet you, Hammond and Caslon," Kili responded as she seated herself before Hammond's desk. The other Jemnisi followed suit, then the humans.

"I presume you wish to talk about next week's visit to the iridium extractor at Aelmor?" Hammond suggested.

"Perhaps later," Kili said. "Of more importance, I expect, are the environmental studies you have been making. Do I correctly believe our life span interests you?"

To one schooled in human diplomacy, Jemnisi honesty and bluntness

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could be both refreshing and disconcerting. It was sometimes also startling, but Hammond managed to keep control of his face. "You believe correctly. May I ask how you discovered this?"

Kili smiled. "Caslon has spent several weeks studying our air and water with great vigor. In addition, rumors have reached us from your own people."

"I see. Frankly, yes, we are amazed by your life span. It is nearly eighteen times our own, despite the fact that our races are very similar. We would very much like to learn more about this."

"It is, unfortunately, a secret of our race," Firnimi spoke up. "You understand."

Hammond nodded. Earth had only a few top secrets these days, but those were guarded jealously. "Perhaps we could purchase the right to study this secret, however. If it would benefit our race we would be willing to pay very highly."

"Such secrets are not trade goods, to be bought or sold," Kili said. "But a trade might be possible."

"What sort of trade?" Hammond asked, though he was pretty sure he knew.

"For generations we have yearned to be free of this world, to learn the secrets of the universe. Since all other attempts to gain this power have failed, the Supreme Ruling Council has agreed to exchange our secret for your star drive."

Caslon shifted in his chair, making the leather squeak. "You seem to have come prepared," he observed.

Kili shrugged. "As I said, we knew of your interest several weeks ago. And our Council does not hesitate over important decisions."

"I'm afraid our government is not that efficient," Hammond said. "We cannot make such an important decision without consulting with our home planet. We will send word immediately, of course."

"Very well," Kili said. "Such delays seem wasteful."

"Oh, they sometimes have their uses," Caslon said. "While we await their reply, perhaps you would allow me to make some preliminary tests of your life-extending technique."

"We cannot allow that until an agreement has been made," Firnimi spoke up. "Otherwise we would have nothing left to trade with."

"I wouldn't need to bring the equipment here," Caslon said. "I could work in one of your labs, bringing nothing out with me. You must understand that we don't *know* that your method will work for humans, whereas the star drive is a purely mechanical device and will work anywhere for anyone."

There was a pause as Kili and Firnimi spoke together in low voices. Afult listened but said nothing.

"Very well," Kili said at last. "In five days we will prepare a lab for you and three or fewer assistants. Rigid controls will be enforced against theft. No electronic communication devices may be used, and any other equipment you bring there must be left until we allow its removal."

Caslon bowed his head slightly. "That will be most satisfactory. You are very generous."

Kili nodded in return, then turned back to face Hammond. "I believe all is settled for the present. Now, you had

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questions concerning the Aelmor trip, Hammond?"

The meeting lasted another hour. Caslon remained after the aliens had left. "What are the chances, do you think?" he asked as Hammond poured a pair of brandies.

"That Earth'll go for it? Hard to say. As Kili implied, they've made several attempts to buy the star drive from us in the year since we landed. With the usual negative results, of course."

"Immortality for the stars is a good trade, though. Popular, too. The Senate would have a hard time politically if they rejected it."

"Yeah, but remember that no other race has ever wheedled the star drive out of us, which makes for a pretty strong precedent. The invention was such a cosmic accident that we may *never* run into another race that has it. So we've gotten extremely rich hauling everybody's trade goods between planets—and wealth, too, is a popular issue."

Caslon sighed. "I'm glad I didn't take up politics." He swirled the brandy in his glass, gazing into its depths. "I trust you recognize the importance of caution in all of this."

Hammond cocked an eyebrow. "I think so. You feel a need to remind me?"

"Well . . . sometimes I wonder if maybe you're a little too taken with this world and its people. Sure, it's a beautiful place full of very civilized beings; but they *are* aliens, and to accept everything they say at face value may be dangerous."

Hammond smiled grimly. "Floyd, I've spent over a quarter century in Contact and Liaison, most of it being highly cynical and suspicious of every action that caught my eye. I like the Jemnisi; I freely admit it. But the mental habits of a lifetime aren't changed that easily. If anything, my judgment's warped towards the distrustful end of the scale."

"Okay." Caslon drained his glass and got to his feet. He seemed embarrassed, as if feeling he should apologize but unsure of the proper words. "I guess I'd better start making a list of people and equipment I'll want to take. I'll see you later, Ham."

Hammond sent the news to Earth on the next shuttle and settled back to await the response. It was just twenty days in coming and began with the arrival of an unscheduled shuttle and a packet of new instructions. Earth was extremely interested in the Jemnisi proposal, but would have to consider it in more depth. Meanwhile, Hammond was to learn as much as possible about the life-extension process. He was also informed that the project had been given a Top Secret designation.

The direct ground-space link buzzed before he had finished reading. Reaching across his desk, he touched a button. "Hammond."

"Orczy, Mr. Hammond." Lieutenant Commander Orczy, captain of the cruiser-transport *Saluki*, was a young man with short blond hair and a serious expression. Today he looked more serious than usual. "I just intercepted another snooper trying to enter orbit around Jemnok. That's four in the past five days."

Hammond grunted. "You send him on his way?"

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"Yes, sir. But if this keeps up one of them's going to eventually get through. I'm not set up for this sort of traffic."

Hammond nodded. The *Saluki's* job was twofold: to act as orbiting base of operations for the Contact Appraisal team and to keep unauthorized craft off Jemnok.

Orczy continued, "I've doubled my satellite network to try and cover all possible directions, but that's only a temporary measure. I'm sending a dispatch to Sector Command requesting a couple of additional patrol boats. I think it'll carry more weight if I can put your name on it."

"Do so. Sorry about this, Commander; I expected news to get out but not quite this fast. Just do the best you can for now."

"Right, sir. We'll manage. Out." Orczy's face vanished from the screen.

Scowling, Hammond considered for a moment, and then punched for his chief political consultant. Shayna Wing's main job was to study and report on Jemnok's political system and to keep Hammond advised of any changes therein. But she had other duties, too. "Shayna, have you had a chance to talk to the shuttle crew yet?" he asked when she came on the line.

"Yes, sir, but I haven't finished the analysis completely."

"I just need one item. Can you tell me if the knowledge of Jemnisi longevity has leaked out yet?"

Her eyebrows arched slightly. "Lord, yes. Nothing official, of course, but rumors abound, most of them with at least a grain of truth. My guess is that all of Earth knows by now, and maybe half of the Colonies."

Hammond thanked her and signed off, holding off an angry grimace until the screen had blanked. Top Secret, indeed! Someone with a loose tongue and matching brain had talked, and the chance was now gone for the Senate to study the matter quietly, without public pressure. Worse, from the short-term point of view, was that the sky around Jemnok was going to become increasingly crowded. And as Orczy had said, someone would eventually get through. Hammond winced at the picture of the gentle Jemnisi confronted by anxious or demanding immortality-seekers.

He jabbed almost viciously at an intercom button. "Has Dr. Caslon reported in yet?"

"No, sir," his secretary told him. "He's been at the Jemnisi lab for the last three days."

"Send a messenger there, please. Tell him I want to see him as soon as possible."

Caslon arrived two hours later, looking tired. "Sorry I took so long, Ham; I was in the middle of something and couldn't quit."

"It's okay." Hammond waved him to a chair, running a critical eye over him as he sat down. "You've been there three days?"

"Oh, it's not like that. The Jemnisi have very nice living quarters set up next to the lab. It's just that we've been too busy to use them much."

"Floyd, we've got trouble." He outlined the premature disclosure and its ramifications. "We need to get information back to Earth as soon as possible before the rumors hit the hysteria level. What have you got so far?"

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Caslon scratched his scalp vigorously. "Okay, here's the basics. The Jemnisi have come up with a synthetic virus that attaches itself to the X chromosome in a cell. Once there, it produces an enzyme that—near as we can tell—somehow inhibits cross-linkage in all the chromosomes during mitosis."

"Is that all?"

"It appears to be enough. It keeps the genetic code from getting messed up when the cell divides, and that seems to keep the cells doing their jobs properly for a longer time."

"How are you testing all this?"

"We've taken human cell cultures from most of the people in the compound. I wanted to start with fruit flies, but the enzyme seems to work in conjunction with a couple of human-specific enzymes already in the cell. Of course, this is good—it keeps the virus from accidentally being transferred to, say, a mosquito. The mosquito could pick up the virus, I mean, but it wouldn't make her live any longer."

"Hmm. Women have two X chromosomes in each cell, while men have an X and a Y. How does that affect things?"

"No problem. All you need is one virus per cell, and according to the Jemnisi once the virus attaches itself it's there to stay. We're checking on that, of course."

"How about people who are deficient in the other two enzymes you mentioned?"

"There aren't any; those enzymes are vital to life. So if the virus works at all, Ham, it looks like it'll work for everyone."

"That will simplify Senate debate, anyway." Hammond toyed with a pencil, playing mental tag with the possibilities.

Caslon seemed to sense that. "There are lots of other questions that'll need answering, but we'll need more time."

"Yeah, I know. Well, try and get reports to me with some semblance of regularity, will you?"

"I'll try." Caslon got up and headed for the door.

"One more thing," Hammond called. He took a deep breath. "Is there any chance of stealing the virus? Earth will want to know."

"None. The four of us humans have a dozen or so Jemnisi lab assistants who watch us like hawks. Security around the lab complex is tight, too."

"Good. Then make sure no one tries it."

Caslon gave him a lopsided smile and left.

The weeks went slowly by, and life in the compound became almost routine again. Most of the initial tests had been run on the Jemnisi virus and Caslon shifted to long-term studies of his cell cultures. As the flood of reports became a trickle, debate and discussion on Earth increased, both in volume and intensity. Even with the courier shuttle arriving weekly now, official news of such things tended to be spotty, and Hammond began relying more and more on Shayna Wing's "scuttlebutt survey" to keep in touch with the outside worlds. Shuttle crew talk was often a bit low on truth, but Shayna was an expert gleaner.

Her reports were not encouraging. Some commentators were beginning to wonder out loud if the Senate was drag-

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ging its feet, keeping the virus off the market for political reasons. Dark rumors hinted that the government was keeping immortality for itself and select groups. Suggestions were being heard that it was time for private citizens to step in and claim the virus as birthright for all of humanity. Increasing numbers of space craft were trying to get to Jamnok, and one of Orczy's four new patrol boats actually had a short laser battle with a ship that wouldn't take no for an answer. That ship turned out to be the property of a pharmaceutical company, and the rumors got worse.

"I trust I didn't pull you away from anything vital?" Hammond asked Caslon as the latter entered the office and dropped into a chair.

Caslon shook his head and accepted the glass Hammond handed him. "Right now we're really just sitting around watching the tissue samples grow and looking for anomalies. My assistants are good watchers, and the cells seem quite willing to grow without me."

"Floyd, we've got to nail this thing down, one way or the other, and we've got to do it soon. I think things are approaching a critical point. We had a government yacht with eight senators aboard show up this morning."

"Oh? I didn't see their ship when I came in."

"That's because it's not here. I told Orczy not to let them land."

Caslon sputtered into his drink. "You *what*?"

"You heard me. Look, if I let *anyone* land, for *any* reason, then I'll lose all real power to refuse anyone else. Otherwise, wherever I draw the line I'll be accused of playing favorites."

"Yeah, but irritating senators could get you a career on Pluto. Even worse, it could start rumors that you're covering up something, or maybe even trying to keep the virus for yourself. And *that* could get you impeached."

"Shayna already pointed that out. But even if those senators immediately press for my removal it'll take several weeks to actually have me hauled back to Earth. So if there's anything wrong with the virus we've got at least a couple of months to find it."

"That's not very long."

"That's why we've got to start now," Hammond said dryly. He glanced at his list of questions. "First of all, can you confirm that the virus actually would give a human an extended lifetime?"

"Definitely. With the cell aging rate we've had we can estimate a new human life span of between fifteen and twenty centuries."

"Any signs that the virus might become inactive, or the enzyme might be rejected?"

"None; in fact, just the opposite. The cell seems to grow more accustomed to the enzyme's presence with each successive mitosis."

"Does the longer life span mean longer yough and middle age, or will it mostly give a longer old age?"

"For the Jemnisi it's the former. I'm not sure about humans yet, but I expect a similar pattern." Caslon's puzzled look was beginning to have a tinge of wariness to it. "What's all this about, Ham?"

Hammond pursed his lips and tried to find words for the feeling that had been growing within him over the past

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weeks. "Look. We were talking to the Jemnisi for six months from space before we were allowed to set up the compound here. About three months later we exchanged medical information, including cell samples. We all then sat around for over half a year until you stumbled on our translation error and found out their true life span. But we know—now—that the Jemnisi are much more advanced in the medical sciences than we are. So why didn't they figure out our life span from the tissue samples and point out our translation error?" He paused, but Caslon remained silent, so he went on. "For most of that same time, you will note, they were trying like crazy to buy our star drive. Their virus is too obvious a bargaining chip for them to have missed it."

"Maybe they were trying not to appear overanxious," Caslon suggested.

"Exactly. But why? And taking that just one step farther, if they can be that deceptive, then their whole facade of openness and honesty comes under suspicion, and with it everything they've said or done."

"That is possibly the most tangled chain of logic I've ever seen," Caslon said slowly. "But it makes uncomfortable sense."

"Yeah." Hammond walked to the window and stared out, hands clasped behind his back. It was late afternoon, and the sun was just touching the horizon, sending streamers of red and purple clouds over the city. "Tell me, did you ever get any more cell samples from the Jemnisi?"

"No. Their cultural modesty is pretty strong."

"I wonder. Are you aware that all the cell samples we studied were from Jemnisi who were over nine hundred years old?"

There was a pause. "You're right. All the Supreme Ruling Council members we tested were middle-aged. I hadn't noticed that before, but so what?"

"I don't know. But it bothers me." Hammond hesitated as if he hadn't already made his decision. "I want you to get me a biopsy probe from your lab before you leave this evening."

The long silence from behind him was bad enough; Hammond didn't dare turn to see the doctor's face. "I see," Caslon said at last. "Okay, but I'm coming with you."

"Forget it. I'm not risking your career, too."

"You haven't got any choice. The Charcot probe came out after you went into the administrative end of this business. You don't know how to use it."

"I learn fast."

Caslon stood up. "I'll need to settle some things back at the lab. When do you want me here? Ten o'clock?"

Hammond sighed, but only half in irritation. He hadn't really wanted to go alone. "Make it about eleven."

The high point of the evening's recreation had long since passed for most Jemnisi and the streets were starting to become deserted. Hammond walked slowly, throwing a glance into every alley they passed, and tried to look less conspicuous than he felt.

"What's the plan, exactly?" Caslon murmured from his side.

"We look for drunks, preferably in isolated spots; ideally, unconscious. We can get a tissue sample in about three

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minutes, can't we?''

''Less. There could be trouble if we're spotted.''

''That's why I didn't want you along. Maybe you should go back.''

Caslon only snorted.

Humans were not a rare sight in the city, as most of the Contact Appraisal team made regular visits. Hammond himself had seldom had the time to come, but he knew his way around well enough not to get lost.

Unlike the human pattern under similar circumstances, Jemnisi seemed to drink singly or in groups. Hammond saw very few couples. That was all to the best, though, since their best chance lay with finding single drunks. Jemnisi drank as much as humans, Hammond had been told. He hoped not all of them had made it home yet.

Caslon tapped his arm. ''Over there, back in that cul-de-sac.''

They were kneeling beside the sleeping figure in a few seconds. The Jemnis wore blue—a female. Crouching with stunner at the ready, Hammond faced the street and waited for what seemed to be several Jemnisi lifetimes. ''Finished,'' Caslon finally said.

They returned to their stroll along the street, Hammond marveling at the sudden rise in temperature. ''I think we should try for six to eight samples, altogether,'' he whispered to Caslon. ''About half males and half—in that alley, look, a male.''

The Jemnis was not yet completely unconscious, but was leaning dazedly against a wall. A silent shot from the stunner finished the job, and Hammond helped the limp figure to a prone position. The red tunic hiked up as he did so, and Hammond reached over to pull it down again . . . and paused. ''Floyd, this is a female.''

''What?'' Caslon glanced where Hammond was pointing, looked again at the red tunic. ''Well, I'll be damned. A transvestite?''

''I don't know.'' Something in Hammond's stomach was beginning to knot up. ''Let's leave her.''

''No sample?''

''No. I want to find a male. We'll watch for red tunics only.''

In the next two hours they found seven more red-clad Jemnisi who were sufficiently drunk and isolated to be safely examined. All proved to be females.

''I wouldn't have believed it,'' Caslon said as they knelt by their final subject.

''Me neither,'' Hammond agreed. ''Let's get back to the compound and try to figure out what this means.''

He turned toward the alley mouth—and froze. Three Jemnisi stood watching them. Hammond raised his stunner, but before he could fire they had scattered. ''Damn! We'd better hurry.''

They moved as quickly as they could without drawing undue attention, sticking to the side streets where possible. ''I've got a communicator,'' Caslon hissed. ''We could call for a Marine guard force.''

''I don't think that'll be necessary,'' Hammond decided after a moment's thought. ''It might be a good idea to put the perimeter guards on alert, though. I've never seen the Jemnisi get violent, but we may have found something they'll fight about. And . . . yes. I'm

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going to have Kili called to the compound. I think it's time for a showdown."

Speaking softly into the communicator, Hammond gave his orders as the two figures slipped quickly through the quiet streets. In the compound ahead, the Marines prepared for battle.

"Roth, sir. Delegate-General Kili is here."

"Any signs of crowds out there, Sergeant?" Hammond asked.

"No, sir, it's very quiet."

"All right. Have the Delegate-General escorted to my office." No need to remind him about sending the Jemnis through the weapon detector; Roth knew his job. Across the room Caslon sat silently in an easy chair, his brow furrowed with thought. Hammond remained silent, though the stillness made him strangely uneasy. For the moment there was nothing to say.

The door opened. An armed Marine at her side, Kili entered the room. For once Hammond didn't notice her gracefulness. "Greetings, Kili," he said, motioning her to a chair and nodding to the Marine. He saluted and left, closing the door behind him as Kili sat down.

"I trust you have called me here to apologize for the disgraceful behavior of your people," she began without preamble. "Two of them were witnessed in the act of molesting a Jemnis. I trust they will be identified and punished."

"As it happens, they will not. The two humans were Caslon and myself, and we were not molesting the Jemnisi. We were looking for the truth."

Kili's face had gone rigid. The extent of their evening's work, Hammond realized, had not been suspected. "Why were the females we saw all dressed as males?" he asked.

"I don't understand. Such a thing is usually unthinkable to my people, although there are certain cults or sects that—"

"Kili." Caslon's voice was gentle. "It's no good. We know that you're hiding your young males, and, by implication, that there is something wrong with the longevity virus. It will save everyone a lot of time and effort if you'll tell us what it is."

Kili stared at the floor. "We bear you no malice," Hammond told her. "We will not seek vengeance if you have misled us. But we *will* have the truth. Where are your young males, and why are you hiding them from us?"

"There are—" Her voice broke. She swallowed hard and tried again, her voice soft and filled with pain. "There are no young males. None have been born here for over three hundred years."

A deathly silence filled the room. So completely unexpected were Kili's words that it was several seconds before Hammond could find his voice. "How?" he finally managed to whisper.

Kili did not look up. "The enzyme made by the virus is . . . addicting, I suppose. Over a long period of time the cell becomes more and more dependent on it, and eventually cannot live without it."

Caslon inhaled suddenly, understanding flashing across his face. "The male sperm cells," he said. "The ones that would produce male children have only Y chromosomes—no X's. Without

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the virus they can't produce the vital enzyme."

Kili nodded. "We had lowered our birthrate to compensate for our longer life span. It took us nearly a hundred years to recognize the disaster, and by then the sperm lifetime had become critically short."

"Sperm banks and artificial insemination—"

"—were only temporary measures. The sperm lifetime continues to decrease and is now measured in seconds, too short for even our most sophisticated techniques." Kili looked up, and Hammond had to turn away from her expression. "You can't understand how it has been. For half a millennium our entire racial energy has been focused on this problem. Slowly but steadily we have exhausted all possible approaches. We were running out of hope—and then you came." She was talking quickly now, perhaps trying to justify her people, perhaps merely trying to cleanse herself of the lie she had been living. "We had never put much effort into space travel, as our system seemed to have nothing to offer as a solution. But suddenly there were the possibilities of other worlds, other sciences. Perhaps in space we could find a cure. And if not . . ." She took a deep breath, let it out slowly. "If not, there was at least hope. Without hope our society would disintegrate and collapse. With it . . . our race could at least die with dignity."

"So you doctored things up to look like a normally-proportioned society," Hammond said, "creating the red-blue tunic convention to confuse us. And when we came to trust you, you offered us the virus."

He hadn't really meant the words to sound accusatory. But they apparently did. "Curse you!" Kili shouted with sudden vehemence. "We tried, Hammond, we really *tried* to get the star drive in some other way. We offered to buy it, indenture ourselves for it, give you medical knowledge for it. But no, you masters of the universe; you were too smug in your riches to care about our desperate need. And why *shouldn't* we have offered you the virus, if you were foolish and greedy enough to take it. Do you think *we* asked for what was done to us, either? We trusted our fathers, too, and they condemned our race to death."

She stood suddenly and stormed to the door. With one hand on the knob she turned back to face them. "Go back to your universe and your short-lived riches, human." Her face was contorted with anger and frustration, and even at that distance Hammond could see the tears in her eyes. "Leave us to our death; and may your own be in agony, far from your home."

She pulled open the door and was gone.

For a long while they just sat there, each man wrapped in his own thoughts. Then Hammond stirred. 'There's no way to use it, is there," he said. It wasn't a question.

"Not unless we give people the virus after they've had one or two children," Caslon said from his chair. "But the population would go right through the ceiling. Earth can't take that, and neither can most of the Colonies."

"And restricting the virus at all

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would make it into an incredible political weapon." He sighed. "I guess we'd better kill it now, as hard as possible. I'm afraid there are too many people who would put their own lives ahead of mankind's survival."

"Yes. We can say it causes sterility in humans—which is true, I guess, in the long run. We've got to really scare them into dropping the whole debate."

Hammond nodded. "Some people might try and get a sample anyway, maybe older millionaires who've already had all their children and could get here in private starships."

"We'll need a cordon around Jemnok. Something to keep them away."

"For eighteen centuries or more? It'll never work."

"Probably not. But we have to try." Caslon stood up. "Maybe we can talk to Shayna in the morning. She might know the right scare-words to use. Good night, Ham. I'm sorry it turned out this way. And—well, maybe it's still not too late for the Jemnisi."

Hammond waited for a few moments after the other had left, then stood and walked slowly to the window. Below, the Jemnisi city was dark, save for the firefly glow of the streetlights. He had always loved the sight; but now the magic was gone from it and he could only see it as a monument to a dying race. Numbly he wished the compound wall were higher.■

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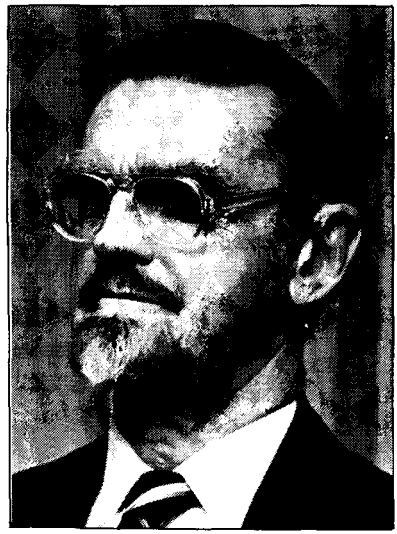

Lyon Sprague de Camp

Anticipating the "Golden Age" of science fiction by two years, Lyon Sprague de Camp made an immediate hit with his first published story, "The Isolinguals" in the September, 1937 issue of this magazine. Interestingly, he came aboard at the same time as John Campbell, who started his editorial association in September, 1937, becoming editor several months later.

Sprague became part of Campbell's team of writers that created modern science fiction. With delight, Campbell announced in the September, 1938 AnLab that Sprague personally astounded the editor with "Language for Time Travelers," a science-fact article that for the first time ever took first place in reader popularity.

Born in New York City, Sprague attended Trinity School there, a military academy in North Carolina, and Hollywood High School in California. He was graduated from the California Institute of Technology with a B.S. in Aeronautical Engineering—just in time for the Great Depression. He then attended Stevens Institute in Hoboken, N.J., receiving a Master's degree in engineering and economics. His first job was with the predecessor of the International Correspondence Schools, and he eventually became principal of ICS' School of Invention and Patenting.

Since 1938 Sprague has been a full-time writer, except for World War II, when he was commissioned and stationed as an aeronautical engineer at the Philadelphia Navy Yard, together with Robert Heinlein and Isaac Asimov.

Asimov has characterized Sprague as "tall, handsome, dignified and learned—exactly as science fiction writers are supposed to be." If Sprague were an actor, he would be type-cast as a British colonel imperturbably holding the Khyber Pass at the head of his regiment. Sprague's wife Catherine is also a writer, and an authority on economics. Of her, Isaac has said she looks like the younger daughter of a British peer and is the most beautiful blonde in science fiction.

Now living in a Philadelphia suburb, Sprague has travelled the world over, doing research for some of his more than 90 books and 350 articles. He has been chased by a hippopotamus in Uganda and a sea lion in the Galapagos Islands, and bitten by a lizard in the jungles of Guatemala.

Personally popular with science ficiton and fantasy fans, Sprague has been guest of honor at numerous conventions, including the 1966 World Science Fiction Convention in Cleveland. At the 1976 World Convention in Kansas City he received the Gandalf Grand Master Award for lifetime achievement in fantasy. In 1979 the Science Fiction Writers of America presented him with a Grand Master Nebula for lifetime achievement in science fiction.

Just published are Sprague's The Ragged Edge of Science (Owlswick Press) and Conan and the Spider God (Bantam). Coming is a biography of Robert E. Howard. Still in print is the would-be science fiction writer's most useful book: Science Fiction Handbook, Revised (Owlswick Press).

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GRAIN OF TRUTH

For this timely tale, the illustration is left as an exercise for the reader.

Charles Spano Jr.

Klaus Memorial Primate
Research Center
April 1, 1990

My Dear Sister Virginia,

I want to thank you for the wonderful week you allowed me at your home last month. Your cooking is truly delightful. Mother would have been pleased. I can only hope my brother-in-law appreciates what a fine woman you are. On the subject of him, dear sister, please accept my apologies for the scene at the table. It was rude of me to call him a mentally undisciplined, credulous cretin.

I make no apologies for my position, however, and you must understand that. Easter bunnies, fairies, leprechauns and UFOs (it makes my pressure rise just to write these words!) are utter bunk and I wish my nephew and niece weren't exposed to such sloppy thinking!

I am glad our mutual inheritance makes us more able than the average to see through that trash.

Anyway, Virginia, my main reason for writing is to give you some good news. Remember that proposal I told you I was presenting to the Director? Well, they approved it!

Tonight I pack and tomorrow I shall be going to the Brooks Range, Alaska to choose sites. The expedition will follow next week. It was tough getting them to go along with the idea that if ancient man crossed the Bering Strait some groups may have adapted to the environment and left traces, perhaps near extinct volcanoes. The data from the Burmese ape find in '79 was what convinced them, I'm sure.

I'm off then and will be incommunicado for some time. I'll send something

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for the children.

Your Brother,
Josh

VIDEOFAX
INSTAMESSAGE—VIDEOFAX INSTAMESSAGE—VIDEOFAX INSTAMESSAGE
subsidiary of Western Union
Anchorage, Alaska
31 May 1990
Ginny

Great news made find stop Pithicene skull type with flesh adhering stop New species says anthropologist stop As geneticist have brilliant idea good for Nobel at least end

Josh

Klaus Memorial Primate
Research Center
June 4, 1990

Dear Virginia,

By now you've no doubt seen all the media coverage of our find but there is one thing we did not release which I alluded to in my previous letter (by the way, I hope you don't mind my using 'Ginny,' I was very excited. Still am.).

My idea hit me as soon as I saw that flesh. If you remember what I told you when I saw you last, I've been pushing recombinant DNA techniques to their limits. I've always felt like a fifth wheel here at Klaus being a geneticist among so many non-geneticists that I had to have something to do with my time.

I've gotten terrific results with plasmid splicing and production of very long synthetic DNA. Fragments so far, but I've worked out a technique to make a full chain of DNA that won't break up.

You're probably ahead of me by now. Yes, I intend to use my techniques to reproduce the DNA in that frozen flesh. I will implant the molecule into a chimpanzee ovum and in a few months the first Northern Ape in half a million years will again walk the Earth.

We haven't released that bit of news because if the experiment fails the Director doesn't want the Center embarrassed. I think he was never happy with me and is a little leery of my project.

When we dug up the borealipithicene we found a lot of grains and spores, too. The biologists and climatologists are reconstructing the Alaskan environment from them as it was back then.

We plan to build a compound here to house the creatures and study them. Obviously the scientific data will be tremendous and I see myself picking up a Nobel in less than the usual time.

I'll stop now. I have a lot of work to do just identifying the fragments of DNA and attempting to learn their proper order before I let the *E. coli* do their work. Write soon.

Your Brother,
Josh

Klaus Memorial Primate
Research Center
July 4, 1990

Dear Virginia,

It's good to hear from you again. I'm glad the children liked the books on Alaskan geohistory and biology but they really should read them not just look at the pictures. I did not send any totem poles as you know very well what my feelings are about such fetishes. Mere artifacts of superstition.

Speaking of superstition, I suppose

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I should offer congratulations to your husband on his doctorate in comparative social belief. I suppose it did involve some work on his part but I fail to comprehend the nature of the subject.

We're making excellent progress on the DNA synthesis. The *coli* are having no trouble at all producing the proper links in the proper order and we shall soon have a large amount of DNA ready for implantation. As for creatures, plural, which I did mention in my last letter, as you've guessed, I've managed to alter the sex of the original sample.

It was a brilliant inductive effort on my part, if I do say so myself, and I'll send you the reports since you're interested. Our first sample was female, by the way, which made it easier to convert the sex though with additional effort a male could have been converted with my technique.

I have to close now, my assistant just called me into the lab. They've found something unusual in the gene makeup they say but if they've fouled up I'll have their heads.

Brother Josh

Klaus Memorial Primate
Research Center
July 20, 1990

Dear Virginia,

I suppose I should have expected you and your husband to discuss what I've been telling you ahead of the mass media consumers but I really must ask that he not worry over such sentimental considerations as fairness to our growing subjects. Fairness doesn't enter into it at all. This is scientific research of the highest order. We will learn what one form of early man was like. It will revolutionize thinking!

If he needs assurance then let him know that our experts will make every effort to simulate the Alaskan environment of five hundred millenia ago and the borealis will have no contact with our civilization. Our monitors will be quite well hidden.

Corrupt them, indeed! And another thing, though I did not mean to imply interest in comparative social belief, I am grateful for the dissertations your husband sent me: *Jungian Archetypes in Selected Episodes of Laverne and Shirley; Comparative Analysis of the Evolution and Characteristics of Demons of Polynesia and North European Little People; Quantification of Belief Incidence in Extrapolation of Afternoon Videocast Personae;* and his own, of course my favorite, *The Correlation of Cognitive Structures, Belief and the Prevailing Personification of Santa Claus!*

He sounds a bit conservative there! Who would have suspected it! I got great amusement from them and it broke the tension and excitement of our latest discovery which I referred to last time.

The boreals have extra chromosomes (the DNA has been dividing nicely but we checked it out before implanting) and our early results indicate some unusual abilities. I'll let you know more later.

Your Brother,
Josh

P.S. Watch the videocast this weekend. I'm on 'Science Speaks' and the Director has consented to let me hint about our work.

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Klaus Memorial Primate
Research Center
October 31, 1990

Dear Virginia,

I must apologize for not having written sooner but as you may surmise the reaction to my appearance last July was astounding! We've had to triple the guard and the State Police are having a hard time with the tourists.

It occurs to me that some people are still attracted to the lure of good science and haven't been swept up in this end-of-the-millenia hysteria. I also think those dissertations are a sad indication of imminent breakdown and I certainly hope you are not letting your husband unduly influence my dear niece and nephew with his ridiculous ideas about belief making reality. It's as if he were saying wishes come true when manifestly they do not. Please, Virginia, stand as a bulwark of rationality in your own family. But enough of that. I'm sure I can count on you.

Our boreals are progressing very well. We implanted the ova with the fully assembled DNA by the end of July. The chimpanzee host mothers are doing excellently. We were worried for awhile about primitive hormones being produced which would terminate the host-mothers but that problem seems never to have existed, the placental filtration is better than modern females or so our obstetrician thinks. I feel there has been a slight devolution in filtration quality, therefore, as witness the harmful things which are known to pass to embryos.

The obstetrician also believes the boreals will be born very soon. An evolved survival trait no doubt. Rapid fetal growth and early birth leading to a higher population would help insure survival especially in the northern environment which by the way is finished. It is cold in there!

The chromosomes you asked about in your August letter carry, I think, instinctive patterns which we as later evolved beings have naturally lost. We'll see in six weeks which is the time left before birth.

Your Brother,
Josh

P.S. I have it on good authority from a friend of mine on the Nobel committee that if this project succeeds the committee will consider speeding up the awards process for me, possibly in as little as two years.

Klaus Memorial Primate
Research Center
November 6, 1990

Dear Virginia,

Great news! They're born! Twenty-four healthy boreals twelve of each sex averaging four kilos but two, a male and a female, hitting close to five kilos. They will be the dominant members of the troop, obviously. Have to go.

Brother Josh

Klaus Memorial Primate
Research Center
November 8, 1990

Dear Virginia,

I have more time today. I wrote my last letter at 2:30 A.M. as the boreals were being born. You will get a chance to see them in a day or so after we're certain they're fit in all respects but I shall describe them to you so you are

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ahead of the mass media.

Each borealipithicene looks much like the representations of australopithicene. They have a chunky torso with a good deal of fat covering the abdomen, short sturdy legs and apish arms. They are covered with long, smooth reddish-brown fur fringed with white at anatomically significant areas: hands, feet and waist. Their faces are smooth-skinned and round as are their heads.

At the rate their brains are developing they will average 1000 ccs, one-third more than the australs but of course these are a different species. Their faces are fringed with white, too, looking much like beards. They have a topknot of reddish fur ending in white and which grows fairly long in the two largest, obviously a sign of dominance. Their feet are black and smooth-skinned on top but roughly calloused on the sole and layered with fat.

Even in their extreme youth they seem very friendly, peering around with bright brown eyes. We expect they won't grow over one and a half meters tall, if that much. They will be let into their environment before the videocast and we will feed the pickup right onto the network and cable hookups.

This is reality, Virginia, not that speculative nonsense your husband teaches. Share this with him, by all means, and I would be very interested to know his reaction. Perhaps it will wake him up.

Your Brother,
Josh

Klaus Memorial Primate
Research Center
November 23, 1990

Dear Virginia,

What nerve! So your husband thinks I don't sound much like a 'stuffed shirt.' Much! I am a scientist. I see things logically, using inductive reasoning from the evidence before my senses. If I have no patience with your husband's brand of nonsense, it is because there isn't any evidence for it.

If he shows me properly verified and verifiable evidence for his fairies and ghosts and elves and whatnot then I shall consider it. Naturally, such proof is impossible. And as for his contention that all legends and social fables or myths have some basis in reality, a grain of truth, I say it is impossible to show without ambiguity any connection. The same with that ancient astronaut nonsense back in the sixties and seventies, remember?

Take the boreals, for example. I had solid bases for speculating on their existence. Investigation proved me right.

Speaking of the boreals, we put them into their environment a few days ago and they are thriving. Their intelligence is totally unexpected for brains that small. One of my assistants believes they use more of their brain capacity than we moderns do. With the evidence of your husband and his ilk, I'm inclined to agree.

They forage very efficiently on the short grain-like plants we found buried with them and they get along very well with the caribou.

One will approach a caribou and sit down in a direct line with its vision.

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They will stare at each other unmoving for a few minutes then, amazingly, the caribou will let the boreal milk it!

Then they do something unbelievable if you haven't seen it (we'll have to videocast that), they mix the milk with pounded grain and cook it! That's right, they have fire.

I believe its some ancestral memory locked in the genes of the sample we found in the Brooks Range.

The food they make is flat and round. One of my technicians was so carried away with that discovery that she crept into the environment after the troop was asleep and took a sample. She also discovered something we had not seen. The borealS make cups out of small branches woven together with caribou fur and lined with clay. They drink caribou milk from those cups. That find is the only reason I didn't fire the technician, it shows advanced toolmaking ability.

Oh, one other thing, the technician tasted the bread-like food and said it was like an oatmeal cookie. I tasted a bit but find no such similarity. Subjective reports make poor science anyhow.

These borealS constantly move. They look very heavy with their abdominal pouches of fat but they move with characteristic primate agility. The smaller ones seem to do the bidding of the larger but that must be due to the dominance factor though we have never observed any fighting or even dominance displays. They seem a completely peaceful, gentle race. I find it calming to observe them after a hard day.

Your Brother,
Josh

Klaus Memorial Primate
Research Center
November 30, 1990

Dear Virginia,

I must protest! Your husband completely misunderstood the last sentence in my previous letter.

I was not reporting scientific data as such but merely remarking on the quality of the lives of the borealS. I only meant that after struggling with incompetents and with the Director that it was pleasant to watch a cooperative society.

By the way, does your husband know any of the staff here? One of my assistants made a strange remark yesterday that sounded as if your husband could have written it. I overheard my assistant mumble some nonsense about how 'elfin' the borealS look. He'll think twice before ever saying something like that again. Elfin! Bah!

The borealS continue to thrive and have extended their toolmaking behavior. Several of them have woven small pouches of moss, caribou fur and tiny feathers from the birds we placed in the environment. They forage berries and crush them to make a crude dye and smear it on the pouches. They make use of snow to get different shades of dye. It is fascinating to watch. They are demonstrating highly advanced techniques. Several ethologists have remarked on how similar the borealS' behavior is to much modern day activities. I can't accept that, not fully. I believe our science has placed us several notches above the borealS as has our technology. I think we've left their culture behind as well.

Your Brother,
Josh

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Klaus Memorial Primate
Research Center
December 6, 1990

Dear Virginia,

Why is it every time I respond to one of your letters I must include some reaction to your husband? It's getting to be annoying beyond tolerance. I will not even comment on his analysis of the borealis, their markings and their behavior. What does he know? Imagine believing the borealis are the true basis for the . . . no, I can't even write it! I will not show the Director, either. And he'd better not write to the Director and tell him what he thinks, though thinks is too strong a word for what your husband does. I will not put up with that humiliation.

Furthermore, not even their latest behavior can be twisted to fit your husband's 'analysis,' for want of a better word.

The gift-giving behavior they now show is quite common to certain species of penguins in the Antarctic. The borealis simply have a refinement. They place small 'gifts' of food or woven dyed fur into the small pouches and they give them to each other. The two largest, now almost fully grown, have made a very large sack and pile the majority of 'gifts' into it. I believe this was common among larger troops though this group of borealis isn't aware they are the only troop.

The big ones also seem able to dominate the caribou and have even tamed eight. They (the two large borealis) lead the caribou around with long woven reins. The boreal troop guards the herd but naturally there are no predators.

I am puzzled by one thing, though. They don't seem to have a language but, as I've said before, they do communicate.

They stare into each other's eyes and some message passes. The same technician who took the cookies and milk claims one of their genes gave them extrasensory perception.

There is a degree of evidence for ESP, I know, but it is so sketchy. Of course, there are their extra genes which we have lost.

There have also been unexplained movements in the compound which this same technician claims could be evidence of telekinesis. Several huge boulders have been moved and muscle-mass calculations we've made show the borealis couldn't have lifted them. There aren't any drag marks so the caribou didn't help either. We will test them by putting a large wall in the middle of their camp tonight after they've gone to sleep. If they've ever moved the boulders it must have been when we've changed the videotapes, though how *they* knew that I can't say. I shall hold off on this letter until after the test so I can tell you the results.

December 7, 1990: What a shock to see how they surprised us! It must be true, though I can hardly believe it! We placed the partition last night, late, and stayed up to monitor them. They woke and jumped over the wall! Incredible! They went straight up at least thirty feet, as high as an average house. We're not really certain if they all have this ability because it was the male who did the jumping carrying several loads of smaller ones. The visual evidence showed he

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apparently stimulated a growth on the side of his nose. I think it may be similar to electric sensing organelles in sharks. This calls for great investigation.

I'll write as soon as I can.

Your Brother,
Josh

Klaus Memorial Primate
Research Center
December 20, 1990

Dear Virginia,

Did you see it? Did you see that nauseating videocast yesterday? That sentimental fool of a reporter! I wonder why the Director let him in? He must have known what was going to be said. Do you think its true that some videasters pay for transmission rights to news events? Ugly thought. The things he said were utterly revolting.

'Cute elfin creatures.' 'Gifts of peace and charity' '. . . with their holiday fur coats and swinging tassled caps and jolly round bellies just as. . .' No, I won't write it. You heard it. Rather, I hope you were spared the trauma. Did your husband have anything to do with that script? I was so sickened I couldn't finish watching. Did he? It sounded like some nonsense he would dream up. Totally contrary to all our evidence and interpretations.

The only thing that media idiot got right was the fact that the borealS are up to something. For the last few weeks they have been working harder on their, well, I won't call them gifts anymore, let's say their courtship offerings which is much closer to the truth anyhow. The large male has a bulging sack of offerings which is natural. Curiously, the smaller males have given him an equal share of offerings. Another curious fact is the lack of sexual distinction among the smaller borealS as compared to the large two who are easily distinguished. Perhaps they develop slower. It doesn't seem possible that I erred in making two sexes.

We'll have to get tissue samples soon and analyze them. There may be genetic changes to explain the sex and size discrepancy.

Josh

Klaus Memorial Primate
Research Center
December 23, 1990

Dear Virginia,

They do talk! At least they make noises. Late last night I was observing them. I'm sure they didn't know I was there but the big male gave me the feeling he was looking right at me and winking at me, too.

I saw their mouths moving and turned up the volume on the audio output panel. We had it low but audible in case they ever made noise. Now, I heard them.

They sat in a circle, legs crossed and hands together. A peculiar sound came from them like a deep throated grunting or coughing sound. The big male led them and it sounded as if he was clearing his throat.

I played the tape back later that day and that same technician made the absurd suggestion that they were laughing.

Virginia! The Director was just in my office and showed me an 'analysis' sent to him, directly to him, by your husband! I thought I asked you not to allow

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him to do that!

What an embarrassment! I had all my reports laid out and was organizing them for the conference in January where I will spell out all our findings and here the Director shows me this ten page package of drivel that I'm supposed to acknowledge in some way.

I tell you I almost laughed in the Director's face. I did repudiate your husband's puerile suggestion that borealipithicenes represent the grain of truth in the Santa Claus tale.

I will not defend or acknowledge that nonsense!

Josh

Klaus Memorial Primate
Research Center
Office of the Director
December 24, 1990

Dear Mrs. Santanicoli:

I am writing to inform you that your brother, Dr. Joshua Hand, was taken ill early this morning though he is in no danger now. He told me he has written to you many times of his work here so I feel it incumbent on me to inform you of the circumstances of his collapse.

It was his habit of late to rise about midnight and check on the borealipithicene compound. This morning he did so and what he found was shocking. Indeed, it shocked everyone though our youngest staffers made the quickest recovery.

You see, the borealis have vanished. The domed roof of the environmental compound was shattered though no one heard any noise.

The only things missing beside the roof and the borealis were eight small caribou which they had apparently had some control over.

We tried to find out if your brother had seen anything but all he said was "He can't be right. Ho, ho, ho."

We're not sure if that means anything and if you can help us and Josh we'll pay all your expenses down here.

We are beginning a search for the borealis but have no leads. Our best guess is that they are heading North.

Oh, by the way, is your husband free to address our conference next month? His paper was most enlightening.

Season's Greetings,
Peter C. Plummer, Director■

● So deep is the conviction that there must be life out there beyond the dark one thinks that if they are more advanced than ourselves they may come across space at any moment perhaps in our generation. Later contemplating the infinity of time one wonders if perchance their messages came long ago hurtling into the swamp muck of the steaming coal forests the bright projectile clambered over by hissing reptiles and the delicate instruments running mindlessly down with no report.

Loren Eiseley

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THE ALTERNATE VIEW

THE STUDY SYNDROME

Jerry Pournelle

Lincoln, Nebraska doesn't sound like much of a place for changing human destiny, even though it is said to have the highest "quality of life" in the US. (I note that quality of life doesn't include getting a drink on Sunday, or after midnight.) Otherwise it's a nice little city with a good convention center, where, this spring, two important events took place.

One was the first face to face meeting of the Board of Directors of the L-5 Society (L-5, 1620 N. Park, Tucson, Arizona, 85719. Dues $20/year). Our board meeting was hardly a destiny-altering event, but the L-5 Society does work toward getting humanity past the "Only One Earth" stage and out into the universe where we belong.

The other event was a five day formal report by the Department of Energy and NASA on the Solar Power Satellite (SPS) concept. That one *should* have changed the world.

Last January, Stefan Possony and I presented a paper at the annual meeting of the American Association for the Advancement of Science. We tried, successfully I think, to show that there are very good reasons to believe the human race will be around for 100 billion years.

Roll that number around on your tongue a bit. One hundred billion years. That is our future. Compared to it, our past is miniscule, vanishing, a tiny drop in the bucket. We are so very young, and so much lies ahead of us; our only limit is the limit to everything, our only certain doom is the end of the universe—and who knows, after a hundred billion years, perhaps we will know how to prevent that too. It may be that as a species we have no inevitable doom; certainly 100 billion years is, for those of us here and now, close enough to eternity.

But to realize anything like the potential, we must outlive our planet. We must outlive our sun. Eventually we will outlive our galaxy.

None of this is impossible. We can today conceive of interstellar ships, although it will be some time before we can build them; meanwhile, the first step is within our grasp right now. We can, if we will, make our home not Only One Earth, but in the solar system at large. In this generation, in this decade, we could put a settlement on the moon. Not a base, or an outpost; but a settlement, a colony; a home. We know how to do this now, with today's technology, for about what we spend on cosmetics, less than what we spend on tobacco.

It is an idea whose time has come; and SPS gives us another reason to start.

Solar Power Satellites are not a par-

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ticularly new idea. They've been around in science fiction since the Golden Age, but they were first seriously proposed by Peter Glaser in 1968. The concept is simple enough: instead of building solar power installations on Earth, where the sun isn't up at night, and weather and season can interfere with the sunlight received, put the solar collectors in orbit and send the power down to Earth.

The concept may be simple, but there are some tough technical problems. SPS is *big*, 10 kilometers long by 5 wide for the solar cells and mirrors. It has an antenna a full kilometer in diameter, employing 100,000 klystron tubes, to send the power down as microwaves. SPS requires massive contruction in orbit, which means long-term life support systems, not only down low under the Van Allen Belt, but up in geosynchronous orbit as well. It's a bold concept; it is too bold?

Concepts are easy. Finding out whether something like SPS is really practical is much more difficult—and very expensive. Although the SPS idea has been around since 1968, nobody took it seriously; but came the energy crunches and DOE decided to look at "exotic" ideas. They took a first cut at SPS—and it survived. They took a second slice, and it still looked good. So finally they bit the bullet and came up with $25 million bucks; enough to take a really hard look. The report of that study was given in Lincoln last spring.

It was a thorough study. Every aspect of SPS was examined. As an example, the University of Calif[illegible] at Davis exposed honey bees to microwaves, then studied their social behavior. There were preliminary studies of antenna sites chosen to avoid migratory bird flyways. Arecibo was employed to squirt microwaves into the ionosphere, with Guadeloupe Island's big dish looking to see what effects that heating might have. Bechtel Corporation (which builds large structures here on Earth) looked at support structures and wind loadings on the ground antenna site. Grumman looked at various control systems for moving around large structures in space. And so forth.

The results were pretty clear: no show stoppers. There don't look to be insoluable problems. True, there are some unanswered questions. Some environmentalists worry about long term exposure to very low levels of microwaves. The Arecibo experiments didn't send up as much energy as SPS would send down, and that's got to be done full scale. Construction in orbit isn't easy. There probably will be some adverse effects on certain commercial FM radio frequencies—the point where the power beam enters the ionosphere becomes a "radio mirror," so taxi drivers in New York may find themselves tuned in to Los Angeles, which means reassigning some frequencies and changing some radio sets.

And so forth. But *any* energy system has problems, which is why DOE included comparative assessment studies in the package: and the amazing thing is that SPS looks pretty good compared to everything else. Even the dollar costs look reasonable. SPS is quite expensive to install; but there aren't any fuel costs, and it's not much more expensive per kilowatt than nuclear power. The SPS

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environmental costs are small compared to coal, and if you add into coal the cost of the rail transport system we'll have to build, then SPS may even by *cheaper*.

Furthermore, SPS development money is spent here, not shipped overseas to buy oil; and while DOE will not allow "fallout" technology to be entered as benefits of SPS, we all know there will be some. The SPS problem would be big. It would involve building new launch vehicles, and it would make space operations routine. Thus we'd inevitably begin industries.

And to make it even nicer, the program phases well; of the hundred billion dollars required for SPS, a full $75 billion is *investment* in a fleet of new launch vehicles. All the engineering research and feasibility demonstrations are done with the first $25 billion.

So. We had a $25 million study, and no one found any show stoppers.

We know the country is in a critical energy situation that isn't going to get better by itself.

So what did the study recommend?

More studies, of course.

It sounds a reasonable principle. Study a number of competing energy systems, and when you know which is best, then and only then do you invest much in it. Don't spend money on an idea that may come a cropper, and don't spend lots of money on a system that costs too much. Get the right system first shot, and if you don't yet know which one that is, why then study until you do. . .

It sounds reasonable, but it's insane, if you concede that the energy crisis is real.

Look: suppose that today you knew which was the "best" answer to the energy crisis. It would still take years before you could produce kiloWatts. Worse: there is an optimum growth for any big program. Starting with too much money can be worse than not starting at all: there are only so many good people available in any given year. Starting up with too much money means that you're hiring anything that can walk up the steps.

So there are start-up lags, and there's a definite limit to the optimum rate of growth of a big program; any big program, whether it's coal, or "heavy oils", or shale, or synthetic fuels, or fusion, or fast breeders. . .

So what should we do? Start them all?

Yes. That is, if you're really serious about the energy crisis, you ought seriously to consider starting a number of projects, with the firm intention of writing off the least promising lines when you know more.

The SPS study included one of the very few comparative assessments of energy systems. It looked at SPS, fusion, coal, synfuels, fast breeders, light water reactors, centralized ground-based solar, and exotics like ocean thermal.

But what they never assessed was the cost of doing nothing.

Yet—aren't the economic, environmental, and public health costs of having no new energy sources quite well known? The public health costs of coal are all too predictable: some 15 to 30 thousand people a year killed by emphysema, not to mention 50 to 100 miners, people killed by train wrecks (by 1998 even with extreme conserva-

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tion we will be mining and shipping at least 6 billion tons of coal each year), etc. The environmental costs are high: those sludges that come out of stack gas scrubbers take up more volume than the original coal did—where do we put them? And what of acid rains?

Doing nothing commits us to coal and oil.

In fact, if I could make one change in the assessment system, I would mandate that all studies examine the effects of doing nothing. I think you'll find it's cheaper to start a number of programs, cancel those that don't work, and eat the losses.

If they are truly losses. Robert Heinlein said years ago that good research always makes money; and that seems a demonstrable proposition. High technology exports kept the US in a favorable balance of trade for many years, and could again if we could ever catch up. At the very worst, some good R&D programs in energy and space would tempt bright young men and women into science and technology instead of accounting and law. . .

Doing nothing is expensive.

Instead, of course, we study the problem—if indeed we do that. A bureaucrat named N. Douglas Pewitt took great pains to declare that he had killed any follow up study of SPS. As I write this, the L-5 Society is frantically trying to get Congress to restore the SPS study funds. But DOE is very proud of the SPS "assessment methodology"—as if study methodology were more important than the energy crisis.

I have a better plan.

One unsettled controversy regarding SPS is just how much of it could be built with lunar materials. David Criswell, formerly Director of the Lunar and Planetary Institute at Houston, finds that about 90% of what SPS needs is found in industrial quantities on the moon. Now true, we don't know whether solar cells can be manufactured in quantity, either on the moon, or in orbit from lunar materials; but it looks a very fruitful field for study. Instead of building a fleet of Heavy Lift Launch Vehicles, Criswell suggests we use Shuttle to send up a lunar exploration/exploitation team. With any luck they'll be able to use enough lunar materials to substantially lower the cost of SPS.

And for that matter, lunar materials are valuable even without SPS. How valuable won't be known until we invest more in lunar refining technologies, but we're going to need raw materials for space industries, and we're going to need mass for constructing space industrial stations. Both could come from the moon.

Which brings us to the bottom line.

We're going to space some day. Why not now? France was saved from the humiliating defeat of 1870-71 by the Eiffel Tower: it may not have been a lot of use, but it was a splendid achievement and a symbol of the vigor of France. Can the United States not be saved from the humiliations of Viet Nam and Watergate by building a lunar colony?

A lunar colony would be a national goal that we could take pride in. It would aid the entire human race, move us all toward that 100 billion year future—

And it might make a potful of money, too. ■

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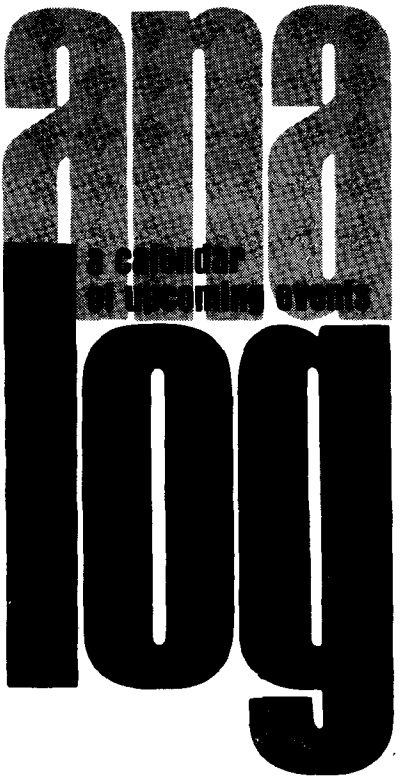

1-4 DECEMBER
Fifth International Conference on Pattern Recognition at Miami Beach, Fla. Info: 5-ICPR, P.O. Box 639, Silver Spring MD 20901.

10-11 DECEMBER
Computer Networking Symposium at Gaithersburg, Md. Info: Computer Networking, P.O. Box 639, Silver Spring MD 20901.

15-18 DECEMBER
3rd Miami International Conference on Alternative Energy Sources at Miami Beach, Fla. Info: Clean Energy Research Institute, University of Miami, P.O. Box 248294, Coral Gables FL 33124.

2-7 SEPTEMBER 1981
DENVENTION II (39th World Science Fiction Convention) at Denver Hilton, Denver, Colorado. Guests of Honor—C. L. Moore and Clifford Simak, Fan Guest of Honor—Rusty Hevelin, Toastmaster—Edward Bryant. Registration—$25 until 1 September 1980. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Denvention II. P.O. Box 11545, Denver CO 80211. 303-433-9774.

by Anthony Lewis

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David Bowie

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It was a cold, blustery Wednesday that first time he came into the El Dorado. It was going on midnight and the place was deserted. Even Lucy and Suellen, our two "working girls," had given up for the night and gone home. I recognized him immediately, of course. Even without my photographic memory I would have known R. J. Cowen.

"Hi," I said, "what'll it be?" I tried to be a study in friendly aloofness. I've always heard that Cowen doesn't like people fawning all over him. That and the fact that he's been known to leave a thousand dollar bill for a tip made me keep my distance.

"You know who I am?" he asked. His voice was a low croak and his eyes were bloodshot. I recognized the symptoms. He had the air of a man in the middle of a week-long bender. His breath confirmed my suspicions.

"You're R. J. Cowen, the sunscreen tycoon," I said. "Care for a drink, Mr. Cowen?"

"Yah," he said. "Uh, a Scotch and water."

The beverage dispenser served up the Scotch with its usual assortment of noises. I retired to the other end of the bar and went back to polishing glasses. He didn't taste the Scotch at all. He just sat there and stared into its dark translucence as though hypnotized. I watched him in the mirror for ten minutes, then put the glass down and sidled back to where he was sitting. He didn't take notice of me until I was standing across from him.

"Pardon me, Mr. Cowen," I said. "It's none of my business, of course, but you look like you need a friend. Anything I can do to help?"

He looked up with those red-rimmed eyes and sighed. "You say you know who I am," he said.

"Yes, sir," I replied.

"Who am I?"

"Some people around this burg say you're the richest man in the world."

He nodded. "Yeah, I've heard that nasty rumor myself. The funny part of it is that it's true. I *am* the richest man in the world. Not only that, I'm richer than the next ten candidates combined. What do you think of that?"

I whistled long and low. Not because it was news to me, you understand. Rather because he seemed to expect it.

"Do you know how I got that way?" he asked, before finally taking a sip from his drink.

"Talent?" I asked.

"Like hell! It was luck. That's right. Pure, unadorned, undeserved, and unexpected dumb luck. You want to hear the story?"

"If you want to tell it," I said. Of course, I didn't know *then* what I was letting myself in for.

Cowen drained the glass dry and asked for another. *Fizz, whirrr, plop* and I had it in front of him.

Remember the Vietnam War? No, me neither. Well, it was one of those brushfire things that went on about forty years ago. Cowen was in college at the time and dropped out to protest U.S. involvment. To hear him tell it, those were the best days of his life. He and a bunch of others traveled around the country in a beat-up Volkswagen. They organized

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demonstrations, burned draft cards, and just generally raised hell.

Then a terrible thing happened. The war ended and Cowen was adrift. He'd been one of the hardcore protesters, a real agitator. Suddenly everything he'd lived for for six years was gone. His side had won and the fight was over. It was like being a knight who tripped over the Holy Grail on the way to the stables to saddle his horse.

After peace broke out he just drifted. It's a heady narcotic to bring down a government. Nothing afterwards was quite the same. He tried consumerism, environmentalism, even Eastern religions. Nothing gave him that feeling of camaraderie and excitement that had been his in the peace movement.

"Have you ever belonged to something?" he asked me. "I don't mean the Boy Scouts or the PTA. I mean *belonged*, like everyone around you was part of your family. That was what I was searching for."

"No sir, can't say I have. Must be a great feeling."

"The best," he said.

Eventually his search took him to Los Angeles where an old girl friend from the protest movement invited him to a lecture on the dangers of nuclear power.

"You've heard of nuclear power, haven't you?" he asked, peering at me through those bloodshot eyes of his.

"Sure," I said. "Used in submarines, wasn't it?"

He nodded. "Yeah, still used to propel some of the real old ones . . . the boats that can't be retrofitted to cryogenic storage modules. But that's about it. Nuclear energy has no other uses. You know why?"

I shrugged. "Something about being economically and environmentally unfeasible," I guessed.

"Damn right it's economically unfeasible. And who do you think made it so?"

"Who?"

"Me," he said, slamming his fist down on the bar.

"Oh, I'm sure you didn't do it single-handedly," I chuckled.

"No, not single-handedly," he said. "There were two of us. But let me get on with my story."

So after that night at the lecture, he'd discovered another crusade, this one even better than the last. He criss-crossed the country in the same beat-up Volkswagen, once again organizing demonstrations and sit-ins. By 1980, they had the nukes . . . that's what he called them, 'nukes' . . . on the run. In the fall of 1982, Cowen was on his way to Arizona to join a demonstration against the startup of the first of five big power reactors out there. Only he didn't make it.

He got sidetracked having the accident that made him the richest man in the world.

He'd gotten off the interstate for some reason, to refuel, I think. It was dinner time and he stopped in a small roadside cafe for a bite to eat. When he had finished dinner, the sun was just going down and he made a spur-of-the-moment decision to drive up into the hills to photograph one of the famed Arizona sunsets. He got the picture, all

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right, but he also got lost. Six hours later he was low on gas again and stopped on top of a small rise to check the pocket compass he carried with him. He turned on the dome light and glanced down at the compass. It was a good thing he did, too.

The flash would have blinded him for hours.

Cowen popped a peanut into his mouth and dropped the shells on the floor beneath his stool.

"Funny things run through your mind when something explodes just over the next hill," he said. "I'd been demonstrating against nuclear power for four years and had learned a lot about how it worked. Know your enemy, I always say. Well one of the first things I learned was that a reactor can't explode like a bomb. Too bad, too, because it would have made excellent anti-nuke propaganda. Still, when that brilliant flash stabbed through the car windows, I thought they had started the power plant up early and she had gone up in a mushroom cloud.

"I spent those first thirty seconds curled up in the seat, whimpering in stark terror. All the scare stories I'd heard flashed through my mind. Worse yet, we'd had a slide show about Hiroshima the month before at a meeting in Kansas. I lay there shaking and all I could see was this picture of a young Japanese girl who had been looking up when the bomb . . . never mind, Joe. No sense ruining your dinner by being too graphic," he said.

"Whatever you say, sir," I said. My name is Marvin Agronski, but if the richest man in the world wanted to call me Joe, that was fine by me.

Cowen continued: "Eventually I concluded that it wasn't the power plant, and I wasn't dead. The next thought was a natural. Plane crash! Weren't planes always going down at night in the mountains? Somehow the thought of a few hundred dead strangers lying mangled just over the next rise didn't seem to bother me as much as that horrible picture from the Hiroshima lecture.

"Against my better judgement, I shifted into first and crept over the hill to see what was burning. I found myself looking down into a little hollow filled with scrubby desert trees. The fire was still shrouded by a clump of bushes. I could hear a loud crackling and an occasional pop as something in the fire exploded. I stopped the car and got out, walking carefully down into the hollow. It was bright as day down there, what with the brilliant white flame casting a glow over everything. It reminded me of high-school chemistry when we mixed some rust and magnesium powder together and set off a thermite reaction. God was it bright!"

"Hey," I said, "we did that experiment too. Burned a hole right through the bottom of the exhaust hood. Old man Higgins was fit to be tied."

He didn't even notice me. He was once more in a hollow in the mountains of Arizona some thirty years ago. I leaned one elbow on the bar and began to pick my teeth, nodding occasionally so that it looked like I was intent on what he was saying. Truth was that I could have left the room and he wouldn't

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have noticed at all.

Cowen's voice was a hoarse whisper as he spoke of that long-ago time.

"Suddenly a figure walked out of the trees toward me, took three staggering steps and collapsed to the ground. I didn't have time to think. I just ran over to where he lay face down and rolled him over. That's when I got my first, good look at his face.

"I'd whimpered in fright when I thought the power plant had exploded. Nothing so mealy-mouthed this time. I screamed! Even after all this time I can still hear that sound in my head. It was a high-pitched, warbling cry of naked fear. It was a girlish scream, too girlish by far. Still, thinking back on it, I was certainly justified in my reaction.

"The man on the ground wasn't a man. It was a thing. In fact, God help me, it was nothing less than a bug-eyed monster!!"

"Are you all right, Mr. Cowen?" I asked, touching him on the wrist. His eyes lost their unfocused look.

"Huh?"

"I said, are you all right?"

"Sure," he said. "Why shouldn't I be?"

"You were just talking about bug-eyed monsters," I said as calmly as I could.

"That's right," he said, nodding. "I was just telling you about how I found Thing after his ship crashed."

"Thing?"

"The bug-eyed monster. Weren't you listening?"

"Yeah," I said. "Only I must have missed something."

"Well, be quiet and I'll tell you about it," he said. I shut my mouth. I'd probably blown my thousand dollar tip. Still, when a man has as much money as R. J. Cowen, you don't call him crazy to his face. Trillionaires are eccentric, not crazy.

He continued his story.

It seems this B.E.M. was purple with slick, oily, black hair and a mouth that opened sideways rather than up and down. That is, it was on a vertical line rather than a horizontal one like a human being's.

Anyway, the thing was slightly smaller than a man and resembled a person in gross detail—that is it had two arms, two legs, and a head. The only thing was that its features weren't arranged the same as ours. Its knees folded the wrong way and it had too many fingers on each hand. Worst of all, it had eyes that glowed in the dark. They were red, glowing coals twice too large and fifty percent too far apart to belong to any human being.

Cowen was no fool. He did the sensible thing. He turned and ran. Only problem was, he took only two steps before tripping over his feet and crashing down on the hard rocks. It was then that he knew what real terror was. His system got a jolt of adrenaline that dwarfed the previous two surges. Deep down in his brain, down where the subconscious hangs out, he could feel a sensation he'd never felt before.

The thing had gotten hold of his mind!

"How'd you know that?" I whispered.

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"How can I describe the color blue? I felt like a piano and the creature was running its mental fingers over my keyboard. First there was a flash of heat, then clammy cold, ten other sensations in quick succession. I had difficulty breathing, dizziness, extreme joy, and an attack of naked lust followed instantly by numbing depression. I began to shiver violently while sweat poured from my body and a blazing rainbow

"Those are the words, but they don't describe what I felt. They are pale approximations, mere wisps of vision compared to the concrete hardness of the real world."

I shivered. "Want a beer, Mr. Cowen?" I was getting interested in this insane story. It was like a fantasy novel. You know it isn't real, but you pretend it is for as long as the story lasts. Except this was better.

He nodded and waited for me to draw the brew.

"What happened next?" I asked.

"There was this clicking sound," he said.

"Clicking sound?"

He nodded again. "Yeah, like you hear when someone energizes the phone screen on the other end sometimes. Except it wasn't a sound because it was inside my head."

"Ah, there it is," said a quiet voice speaking accentless English in Cowen's brain. "I apologize for any discomfort I may have caused, sir. When I noted your prediliction for using one of your grasping appendages in preference to the other, I naturally assumed your brain would be most developed on that side. However, I now see that you are cross-connected and that I've been searching the wrong hemisphere of your cortex for the speech center."

Cowen didn't say anything. The situation wasn't covered in his repertoire of automatic responses. So far he had been lying face down on the ground, unable to move. He lifted himself to a sitting position and faced the creature. Its eyes regarded him unblinkingly. Cowen mentally cleared his throat and formed a question in his mind.

"Who are you?" he asked.

"Not so much volume, please!" the thing said. "You are an extremely powerful telepath for one who is untrained. Moderate your responses. Do not think so forcefully."

"Okay." Cowen thought less forcefully. "Who are you?"

"You may call me . . . Thing. As you can see, I am an alien. My ship is destroyed and although uninjured, I require your assistance. If you would be so kind."

"Look, I'm a little busy right now," Cowen muttered sarcastically, falling into the lifelong habit of speaking his thoughts. "Perhaps I could drop you off at a police station. The authorities will know what to do with you."

"I am sorry, sir, but that is impossible. This planet is under quarantine. That you know of my presence is bad enough. None other must learn of it. You must hide me until my comrades are able to effect a rescue."

"What about your ship?" Cowen asked, pointing a thumb at the blazing

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fire in the hollow.

"The generators are aflame. In another twentieth of one planetary revolution there will be nothing there but a charred spot of gound."

"How long until you are rescued?"

"No more than a year."

"A year!" Cowen screamed. "How do you expect me to keep a bug-eyed monster secret for a year?"

"Perhaps you could hide me in your domicile."

"I don't have a domicile. Besides, I have my own life to live," Cowen said. "Sorry."

The burning red points stared at him in silence for a minute. He still felt no desire to get up and run for his car, so he knew it still had him. Finally, it spoke.

"I would be willing to pay whatever you wished."

"You mean money?"

"If that is what you desire," Thing said. "Anything in my power as payment for harboring me until I am rescued."

Now this was an intriguing turn of events, Cowen decided. That is, if the creature wasn't bragging about its abilities. He suddenly wondered how a shipwrecked sailor would go about bribing a native of a South Sea island into helping him. Would his promises be anything but empty words?

He decided a test was in order.

"Okay," he said. "Make it so the atom bomb was never invented."

"Changing that which already exists is beyond my power."

"Hmmm, thought so," Cowen said. It was beginning to look like he'd gotten the cheap model of Aladdin's Lamp. Not only was the genie offering only one wish, but he was also choosy about what that wish could be.

"I don't suppose you could get rid of all the nuclear power plants in the world, either."

"I could," Thing said, "but such overt action is forbidden by the quarantine regulations. Pure knowledge is more my specialty."

"Oh, peachy," Cowen said disgustedly. "If there is anything the world already had too much of, it was pure knowledge. Look at the automobile. If it had never been invented there wouldn't be any smog, urban sprawl, ugly parking lots, drunk drivers, etc., *ad infinitum*. If only we had invested all those billions into something clean, safe and inexhaustable . . . like solar power, for instance."

At that point the proverbial light bulb went off in his head. He'd just had one of those insights that comes along once in a lifetime. He would not only call the creature's bluff, but he just might remake the world in the process.

"I've got my wish ready," he said.

"Yes?" Thing answered.

"I want a cheap, efficient means of capturing the sun's rays and turning them into electricity."

"Is that all?" Thing asked. "We have had such a device since the dawn of our history."

"It's got to be as close to one-hundred-percent efficient as possible," Cowen said. "I don't want any of these three percent solar collectors we've

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been fooling around with."

"Of course," Thing said, making it sound like the easiest trick in the world. "Complete efficiency is not possible in the real universe, you understand. But the energy absorption screen is so close that you will barely notice the difference."

"How about cost? If it isn't dirt cheap to produce, the damned oil companies will get control of it like everything else."

"The cost will be minimal once the factories are tooled up," Thing said. "It should cost less than the material from which your clothes are manufactured. Is that satisfactory?"

"Right on!" Cowen yelled. Then a dark suspicion crept in to put a damper on his enthusiasm. "How do I know you will keep your part of the bargain?" he asked.

"I must construct a signaling device. I will not begin to manufacture the . . . you might call it a radio . . . until I have demonstrated my good faith." Thing regarded him seriously once more. "Is it a deal?"

"It's a deal!" Cowen said.

Suddenly the mental restraint that had kept him from using his legs was gone. He probed deeply into his mind. There was no trace of the strange lethargy of a few seconds before. He was once more in control of his body and his fate.

"Or so I thought at the time," he said.

"What happened then?" I asked.

Cowen belched loudly in my face. The smell from his breath was nearly overpowering. He didn't seem to notice as he continued his story. "I rented a place in Pueblo, Colorado and fixed up the basement as a small workshop and living quarters for Thing. I wiped out my savings doing it. Luckily, Thing had salvaged a few hundred feet of gold electrical wire from the wreck before it burned, so we had money to spare.

"We holed up for six months and spent every waking moment on the device," Cowen said. "Three months after setting up shop we had our first working model. I imagine you've seen pictures. Old *Mark I* is in the Smithsonian now."

I nodded. "I took Hazel and the kids to Washington the summer before last. I remember it because it had your name on a brass plaque on the display case, Mr. Cowen."

"I'd gone out to stock up on groceries. Thing didn't eat meat, so he went through a lot of lettuce, carrots, and rutabagas. As soon as I got back to the house I heard his telepathic call to get down to the basement. There in the center of the table we used as a lab bench was a black void. It was as though I was looking through a square window into the blackness of space. Two small wires were clipped to the edge of the contraption and attached to a nine-volt battery—the kind you use for a transistor radio. Another pair ran to a hundred watt lightbulb. The light glowed brightly."

"That it?" Cowen asked Thing after he'd found his voice again.

Thing rippled his whole body, which was his way of nodding. "That is it. It aborbs all visible light and everything

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into the high ultraviolet with ninety-seven percent efficiency. With proper control of our process, we can tune it down to pick up the infrared region as well."

"Thus was born the sunscreen," Cowen said, sighing.

Cowen glossed over the next part of his story. It seems that he and Thing worked sixteen hours a day for three months to perfect the screen. In addition, Thing tried to teach him the theory behind it. Cowen had never been much good at science and it was tough sledding. But they kept at it. Part of Cowen's deal with the alien was that he would learn enough about how the device worked so that he could plausibly claim to have invented it. In the end, Thing settled on merely giving Cowen the cookbook rudiments, the backyard mechanic's explanation, the barest smattering of knowledge necessary to put up a good front.

By the end of six months Cowen's patent was pending and he had begun negotiations with various companies for the right to manufacture sunscreens under license. While he traveled with his demonstration model, Thing began to construct his "radio" in the house in Pueblo. Cowen had laid in a stock of canned vegetables and didn't see the alien for two months. The sales trip proved profitable. By the time he returned home he'd made deals with General Electric, RCA, and Matsushita of Japan. Others were pending, but those three were already modifying their factories for sunscreen production.

"That homecoming was a surprisingly emotional one for me," Cowen said. "Even though Thing was an alien, I'd gotten used to the reassuring feel of his mindtouch, the emotional support he gave me when I was feeling low. And he was as glad to see me as I was to see him. Possibly he was merely tired of canned vegetables and wanted to get back to the fresh stuff, but I couldn't help but believe a real friendship had developed between us.

"Whatever the reason, we had a good old-fashioned bull session that first night. I was feeling down. The papers were full of a big Clamshell Alliance rally to protest the continued construction of the Seabrook Plant. I was feeling a little homesick for the movement. There they were out on the front lines getting smacked with billy clubs, and I was holed up in Pueblo with a shipwrecked alien. Thing noticed my funk, of course. I told him about it."

"A strange puzzle."

"What is?" Cowen asked.

"The human reaction to a problem. Do you attempt to analyze the situation and determine the best course of action? No. Rather your first thought is to climb the nearest hill and bay defiance at the stars. Only later does reason come over you. Surely this is not the most efficient means of finding solutions—"

"I don't get you," Cowen said, puzzled.

"You wish an end to the dangers of nuclear power. But are you happy working quietly toward that end as we are doing? No. You prefer to plot confrontation with your enemies. What is this need of yours to 'go public' as the

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expression goes?''

''But it's only been four years since Three Mile Island. How long before the next nuke goes haywire, killing a few thousand people this time? We have to keep the pressure on while the public remembers. How else are we going to win?''

''As you *are* winning. By introducing sunscreens and making all other forms of power generation unattractive.''

''Do you really think sunscreens will end nukes?''

''Yes.''

''How can you be so sure?'' Cowen asked.

''Because the companies that generate electricity in your society have fixed expenses they must meet. As sunscreens are introduced, demand for their product will fall and they will be forced to raise rates. As rates increase, demand will drop further. It is obviously a situation wherein positive feedback controls events, a vicious cycle, a diverging series.''

''Then the utilities will go bust?''

''The utilities will go bust.''

''He was right, too,'' Cowen said, looking at me with tears in his eyes. ''Five years after that conversation the last nuke in America pulled its core and closed down for good. Thing predicted a lot of other things that night: the end of cities as we knew them, population sprawl, solar farms, the return of cottage industry, the spiraling standard of living. He even predicted the stock market crash of December '83. Not the date, of course, but the event.

''And with his talk of Depression, I began to have second thoughts about what I had wished into being.''

Cowen looked at Thing with tears in his eyes. ''Have I done right?'' he asked. ''A lot of people are going to be out of work because of me.''

''Temporarily,'' Thing agreed. ''But perhaps it will help to think of it this way. Electricity is to your civilization what fire was to your distant ancestors. Only your people have surrendered control of your fires to a few powerful individuals. And if you desire to warm yourself on a cold night, you must pay for the privilege.''

''So?''

''Sunscreens are going to change that. In effect, you have taken the fires of your civilization and given them back to the common people. As long as energy remains inexpensive and readily available, no man may bar another from his source of heat and light. Isn't such a world preferable to your current system?''

Cowen nodded. Put that way it made a lot of sense.

''We talked far into the night exploring alien concepts of government, religion, and ethics,'' Cowen said. ''It was the closest we ever came to understanding each other. It turned out to be our last chance to try.

''Thing was rescued at the end of the year. I took him up into the Rockies and a saucer-shaped craft floated down from the sky, hovering a dozen feet off the ground while he boarded, then zoomed off without a sound.''

''Interesting story,'' I said, letting

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out a deep sigh. Only then did I realize I had been holding my breath. I picked up my towel and began polishing the bar once more. "Interesting, but I can't rightly say I believe it, Mr. Cowen."

"Don't blame you, Joe," he said. He made a face as he tossed off the last of his sixth beer of the evening. "Where's the john?"

I pointed back in the corner where the restrooms are located.

He inched his way off his stool and steadied himself against the bar before staggering in the indicated direction. I bit my lip. What if R. J. Cowen, the richest man in the world, slipped and knocked his brains out against a urinal in my place? I wondered how many lawyers he kept on retainer for just such an eventuality.

I breathed more easily when he reappeared after five minutes. This time he walked with the air of someone who is trying to appear sober. You know the look. The too-too careful walk. I had a bad premonition that he had just been sick all over my nice clean restroom.

"Doing better?" I asked when he'd hoisted himself back onto a stool.

"Better, Joe. Thanks. What have you got back there that's fit to drink?"

"I think you've had enough, Mr. Cowen," I said, expecting him to explode. He obviously wasn't the type of man used to having people tell him no. But he didn't. He just sat there and nodded sagely.

"I think you're right, Joe. I just want one to calm my nerves before my chauffeur arrives with the car. Called him from the screen in the hall outside the john. Besides, you want to hear the end of the story, don't you?"

"You mean there's more?"

"There's more," he said, nodding. "Now what have you got?"

"The owner keeps a bottle of forty-year-old brandy in the safe. He bought it for an investment, but says he'd open it if the right special occasion came along."

"I'm about to finish telling you the rather unique story of my life and that brandy will be the last liquor I ever drink. How much more special can an occasion get?" Cowen asked.

"I don't know," I said, dubious. "Stuff's pretty expensive."

Cowen laughed out loud at that. After a few seconds I had to join in. Considering who I was talking to, it *was* pretty funny. I fetched the brandy from the back room and made a ceremony of opening it.

Then I poured him half a beer glass—the *El Dorado* not being that highclass a bar, we don't stock brandy snifters—and set one up for myself. "On with the story," I said.

"On with the story," he agreed, not touching the drink. His eyes got all misty and he continued talking in a quietly authoritative voice that was somehow different than his earlier speech pattern. Before he'd just been a drunken bum in expensive clothes. Now he seemed to have gotten some of the steel back into him. He looked more like the Captain of Industry he really was.

"Not much of interest happened to me for the next thirty years," he said. "Not until three weeks ago, in fact."

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I held my silence. In the last thirty years R. J. Cowen had been married and divorced four times, had half his stomach removed, developed chronic high blood pressure, and had one son killed in a traffic accident. Another child—a daughter, I think—had joined a Provincialist commune somewhere in Alaska. Also in that time his fortune had doubled and tripled and doubled again. But if he considered none of that to be of interest, then who was I to argue?

"What happened three weeks ago?" I asked.

"I was lying in bed with a throbbing headache. It was midnight and I lay in the dark, staring up at the ceiling, trying to drift off to sleep. I was just about to succeed after counting my thousandth sheep when a strangely familiar feeling came over me.

"At first I couldn't identify it. It was like seeing red and suffering from double vision at the same time. Except it wasn't only my eyes. It was as if my whole body had suddenly twinned. I could feel the cool night breeze on my skin at the same time as I seemed to be submerged in tepid water. I could hear the hoot of an old horned owl that lives out back, and yet there was also a strange silence in my mind. My mouth tasted of bile. Yet somehow, I could taste the metallic bite of sulfur too. My thoughts took on a curiously echoic quality, sort of like a telephone line that isn't quite properly damped at the other end.

"In spite of the strangeness of it all, I couldn't shake the feeling that this had happened to me before. Then it hit me," he said, his voice dropping once more to a hoarse whisper.

"It was Thing. He was back."

"What'd you do?" I asked.

"Do? I screamed '*Thing*' at the top of my lungs—both mentally and actually. He didn't seem to hear me, though, which was strange. How was it that I could read him and he couldn't read me? He was the trained telepath, not I."

"Didn't he say you were a strong natural telepath?" I asked.

Cowen nodded. "I finally decided that was it. I've had these hunches all my life. Some people would call them intuition. Maybe that's my talent showing through. Anyway, whatever the reason, I found myself with a direct circuit to Thing's mind. It must have been his subconscious because I could hear what he heard, see what he saw, and he didn't seem to notice me. Not that it was all that clear, you undersand. Mostly I felt sad about something. Only I couldn't quite figure out what I had to feel sad about.

"I spent the rest of the night trying to contact him. By dawn I was exhausted and still hadn't had any luck. He was completely oblivious to my presence. But the effort hadn't been wasted. My link was stronger than ever. I could feel him tugging at me from somewhere to the west. So I hopped out of bed at first light and fired up my private plane. If I couldn't get him to come to me, I decided I would go to him."

I chuckled. Cowen's private plane is

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a converted VTOL airliner that he keeps hangared on his estate. Everytime he revs up those lift fans, you can hear teeth gnashing all over Williamsport . . . especially around dawn. But Cowen owns this burg. And nobody complains too loudly about the noise if it's their landlord making it.

"How'd you find him?" I asked.

"I followed the mindtouch," Cowen said. "I really can't explain it. It was like having a compass in my head. I would instantly recognize when I drifted off course. Eventually, I found myself headed for the Rockies and suddenly I knew where I was going."

"Where?"

"As I flew over Kansas I got a brief flash of Thing's surroundings. I recognized the clearing where the saucer had landed to rescue him. I'd been there enough times to recognize it, even after thirty years.

"I landed the plane about a quarter mile away in another, bigger clearing. Thing must have heard me because I felt his questing thought as I was hovering for a landing.

"—*Robert*!—" Thing said as he recognized Cowen's mindtouch.

"Hello, Thing," Cowen said. "Didn't you hear me calling?"

"—Calling?—"

("He was surprised, Joe. He hadn't heard me until I was practically on top of him. It was his mind. It wasn't as fast as it had been. His thoughts weren't as sharp either. He was old, Joe. Time had aged him.")

"You're an old man now, Thing," Cowen said as he hiked toward the clearing where the alien sat.

"Yes, Robert, I am old and nearly past the time when I can be of use to my race. I perceive that you too have aged since last we met."

"Why'd you come back, Thing?"

"I am on a pilgrimage. This was the scene of my first great triumph. I have returned to see the effect of my efforts . . . And perhaps to beg your forgiveness."

"Forgiveness, Thing?" Cowen redoubled his speed toward the clearing. Soon he was trotting among tall pines, panting from the unaccustomed exertion and altitude.

"For our terrible ruse."

At that moment Cowen burst into the clearing. There, sitting quietly on a log facing him, was a familiar figure. The oily black hair was the same, but the purple skin had a distinct greenish tinge to it. The figure was stooped. All effects of age Cowen knew without knowing how he knew. The red eyes gazed at him, unblinking as always.

"Hello, Robert. It is nice to see you again."

"Hello, Thing. What ruse?"

"Why, the sunscreen, of course."

"I don't understand," Cowen said.

"It is simple. My race has long dominated this arm of the galaxy. We have done so by denying access to the stars of any race we feel we cannot control. It was decided thirty years ago that humans are such a race. I was the agent assigned to lock you in your cage. That was my mission here."

"Locked into our cage?" Cowen asked. "How did you do that?"

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"By giving you the sunscreen."

"That's silly, Thing. The sunscreen was my idea. It was the answer to all of humanity's prayers."

"Can you truly say that something was your idea when your mind was under my control at the time?"

"Okay, so maybe you planted the idea there. It was still the best thing to happen to us in the last thousand years."

"No, it was not," Thing said, sitting quietly and gazing into Cowen's eyes. "You have been tricked. I find that as I grow older and wiser, I have come to regret my part in the affair. I suppose you might say that I have developed a conscience."

"But it *has* been good!" Cowen insisted. "All the benefits you predicted have come true, and more. We have taken the miracle of fire and placed it in the hands of the common man. There hasn't been an electric bill paid in the United States in twenty years. The sunscreen has given us economic independence."

"How is your space program, Robert? It was quite a booming thing when last I was here."

"It's booming bigger than ever, Thing. We have ion drive spaceships powered by huge sunscreen sails dozens of kilometers on a side. They routinely travel to the scientific outposts on the Jovian moons. That's something no mere rocket could ever do. The radiation shielding to protect the instruments and crew from Jupiter's radiation belts alone masses enough that a rocket couldn't get it out of orbit."

"Have your ships gone farther out than Jupiter?" Thing asked.

"They launched the Uranus expedition two years ago. That's about it. We are concentrating on the inner planets at the moment. Besides . . ."

"Besides, your existing designs are inefficient at that range from the sun because of power limitations. You are marking time until you can design ships with larger collector sails to operate in the outer solar system. True?"

"True," Cowen answered. "How did you know that?"

"Because that is the nature of the great ruse. In your own idiom, you were suckers. You were concerned about the shortcomings of your existing energy supplies. You perceived coal as being too dirty, nuclear power as being too dangerous, oil as being too expensive. What you needed was a source of energy which is clean, safe, cheap and inexhaustible. In effect, Robert, you told me your fondest wish and I made it come true."

"So?" Cowen asked.

"So, in spite of all their shortcomings, your traditional power sources have evolved along a path of which you are painfully ignorant. Your whole history has been one of developing energy sources of ever greater density and efficiency. Each time a breakthrough was made, it was in the direction of packing more kilowatts into each cubic meter.

"Left to itself that process would have continued to its inevitable conclusion. Animals gave way to steam; first wood fired, later coal and oil fired. Fission was in the process of supplanting the fossil fuels, and fusion would have

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followed fission. Finally, at the end of the chain, you would have developed total mass-energy conversion and won free to the stars."

"I don't understand."

"A hyperwave generator gulps many billions of ergs in order to warp space around a starship. It must be powered by a miniature sun. What we have done, Robert, is divert you from the path that culminates in the development of that tiny captive star. Instead we have sidetracked you into the low density dead end of solar energy.

"Getting power for your industry is simple. If you need more, just unroll a few more acres of sunscreen. But the solar flux is a constant at any given distance from the sun. That's easy to forget unless you are designing a spaceship to explore Pluto. Once you have collected the energy that falls on a given area, there isn't any more to harvest."

"So we just roll out more sunscreen," Cowen said with more optimism than he felt.

Thing sat there for a moment, his red eyes cast down at the ground beneath his feet. "You quickly reach the point of diminishing returns in space. The extra energy collected is not sufficient to offset the extra mass of the collector."

"So, we use sunscreens on Earth and develop mobile sources of power for space."

"No, Robert. You will not be able to interest anyone else in such a plan. The sunscreen is too cheap, too easy. Why would anyone invest in a new power source when you now have all the power you could ever want at one-millionth the cost? Face it, Robert. We have chained you to a single star and here you will remain. One day humanity will destroy itself, and the problem which you represent will be solved."

Cowen sat quietly, not sure what to say. Finally, he spoke. "And you did this to us, Thing?"

A great sadness flowed over him as Thing considered his answer. "Alas, old friend, I did. I was young and . . . you might say idealistic, I suppose. I was much filled with the greatness of my race and our rightful place as masters of the galaxy. I have seen much since that time. I have come to regret my actions, but as I told you so many years ago, I cannot change that which is."

"Of course you can," Cowen said.

"No. My ship will return for me shortly after dark. I go home with it to live out my last days with my guilt. I fear my remaining years will not be many, for it weighs heavily on me."

"That was the last word he said to me, Joe," Cowen said, tears once more in his eyes. "We sat in silence all day, just feeling each other's presence, remembering a time when we were both much younger. The saucer came shortly after dark as he said it would, and he was gone."

For some reason I found I had tears in my own eyes. Must have been something in the air. I wiped them clean as unobtrusively as I could. "Jeez, Mr. Cowen, you sure know how to end a story on the downbeat."

"Why do you think I've been on a

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three-week bender, Joe? I've mortgaged the human race's future. Thing was right. With the perfect energy source already in hand, who's going to invest in some other technology? Look at the government. They've spent their entire energy research budget for twenty-five years perfecting ever better storage devices to smooth out the day/night cycle of sunscreen power production. The world runs on sunscreen-produced electricity or cryogenic hydrogen electrolyzed from sea water by that same sunscreen-produced electricity."

"Maybe you could convince them, Mr. Cowen. Tell them the story like you told it to me."

He got a little smile on his face. He looked happier than at any time since he came in the place. He glanced down and seemed to see the brandy for the first time in about fifteen minutes. He picked up the brandy, holding it up for a toast. I picked mine up as well.

"To the human race, Joe," he said. "We're not licked yet!"

"Right," I said, letting the forty-year-old brandy slide smoothly across my palate.

There was the crash of two glasses hitting the floor, just like in the movies.

The mood was quickly interrupted by the arrival of a big, black turbo limousine out front. Cowen looked at it through the grimy front window and sighed. "Looks like it's back to the old grindstone, Joe. How much do I owe you?"

I hit the total button on the computer and his bill for the regular drinks flashed on the screen. I hesitated about the brandy. Finally, I decided to charge him $2000 for the bottle. He didn't even bat an eye, just peeled off three bills and handed them to me. I gave him his change, which he slipped into the right-hand pocket of his jacket. Then he reached into his wallet, and extracted a tenner note. He handed it across the bar to me.

"This is for you, Joe," he said. "For being such a good listener."

I dropped my hands to my sides and shook my head slowly. "No thanks, Mr. Cowen. It's not that I couldn't use ten thousand, because I could. That's more than I make tending bar in a month. But if I took that tip I'd just be your bartender again. I'd rather think of myself as your friend. If you don't mind, that is."

He nodded and put the bill back into his wallet. "I understand, Joe. And thanks. I could use a friend." He turned to leave and got halfway to the door before turning back. "I do have a tip for you, though. A friend's tip."

"Friend's tip?"

"Hot insider news about the stock market. You do play the market, don't you?"

"Sure," I said. "Doesn't everybody?"

"It's not common knowledge yet, Joe. In fact, I just made up my mind in your john back there. Sunscreen Labs is going to start a crash program to develop both a total mass-energy converter and a starship hyperwave generator come Monday morning next. Thing forgot something. When I was rummaging around in his mind, I picked up a

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helluva lot of miscellaneous facts. One of them might be just the clue we need. And you can bet your last dollar on one thing, Joe."

"What's that, Mr. Cowen?"

"Sunscreen Labs will be a lot more efficient at finding the answer than the government would. We'll make the Manhattan Project and the Apollo Program look like they were run by anarchists. After all, I know where I am going and am anxious to get there. I want us out among the stars while both Thing and I are still alive. I want to see the expression on his face when he discovers how I've outsmarted him."

"Do you think you can do it, Mr. Cowen?"

Cowen shrugged. "I'm going to try, Joe. I'm swimming upstream against the current, and that's for sure. The stockholders are going to be after my scalp. The first thing I'm going to do is hire the best advertising brains on Madison Avenue. We'll have to think up some good basic slogan that short-circuits the pocketbook reflex and goes straight to where we really live—our pride, our love of a good fight, our innate knowledge that we are the best people in the whole damned universe."

"You mean like 'Millions for defense, but not one cent for tribute'?"

Cowen smiled. "Yeah, something that doesn't make too much economic sense, but gets at the deeper truths in life."

"It will cost millions, Mr. Cowen," I said.

"Millions, Joe? Trillions. My whole fortune could be eaten up in the first year holding the line on Sunscreen stock. As soon as the stockholders get wind of the rumors that I've flipped my lid—and you can bet they'll start flying soon enough—they will dump their stock so fast your head will swim. But as soon as we get rid of the weak sisters, the opportunists, and the speculators; as soon as our research starts showing some results; Sunscreen stock should take off—if you'll pardon the expression—like a rocket.

"This is your chance to get in on the ground floor, Joe . . . if you want to, that is."

"I want to, Mr. Cowen."

"Good man! You'll die rich yet, Joe. Besides, the honor of the human race is at stake, and that's worth infinitely more than mere money!" ■

● In older science fiction, the Machine and the Great Idea predominated. Modern readers—and hence editors!—don't want that; they want stories of people living a world where a Great Idea, or a series of them, and a Machine, or machines, form the background. But it is the man, not the idea or machine that is the essence.

John W. Campbell Jr.

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THE UNION FOREVER

Mack Reynolds

The section of the Bureau of Labor Draft to which he had been summoned was located in Greater Washington. Fuming indignation, Perry Altshuler went down to the nearest vacuum tube transport terminal and got a twenty-seater there for the capital. At the central terminal in Greater Washington he left the larger vehicle and took a two-seater which he dialed for the office indicated in his letter.

Perry Altshuler couldn't have known it but he resembled remarkably that movie star of yesteryear, Alan Ladd—Alan Ladd playing the part of a thirty-year-old jerk.

He stepped out of the two-seater into a sterile looking government office and strode belligerently over to one of the reception desks. He looked down at his labor summons and said into the desk screen, "Perry Altshuler to see Herman Banning. Order Number LD-6-52100-K."

The screen said in the standard flat voice, "Please go down Corridor M to Room 421."

It was no problem finding Corridor M. Perry Altshuler strode along it, letting his indignation grow as he went. Some nerve!

At Room 421 he activated the door screen and scowled into it. He said, "Perry Altshuler, on appointment."

Herman Banning was a small, thin type and on the intense albeit weary side. He looked up from a report on the screen on the desk before him.

He said, "Mr. Altshuler? Have a seat. Congratulations."

"Congratulations!" Perry Alshuler glared at him. "What kind of curd is this? I've had my plans all upset. Do you think I've got nothing to do but trek all the way down here just because you cloddies have made some silly mistake?"

"Sit down, Altshuler. Why do you think that a mistake has been made?"

Perry Altshuler assumed a put-upon expression but sat. He said patiently. "I'm an IBM tabulating operator. I don't know how to do anything else. I'm not eligible to do anything else. I don't *have* to do anything else. I passed my tests for IBM operator years ago.

Confronted with a big problem,
you can try to solve it—or learn to use it.

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That's my labor category. I know my rights."

The other looked at him, his expression tired. "I know my rights," he repeated. "If I've heard that once, I've heard it a thousand times from draft dodgers sitting in that same seat."

"Draft dodger! Some gall! I'm willing to serve if the lottery hits me. I'm as patriotic as the next man. You can't insult me!"

"How patriotic is the next man these days?" the other said rhetorically. "Why did you pick that particular labor category, Altshuler?"

"My father was an IBM operator. My grandfather was an IBM operator. When I was a kid, I was trained to be one. I have a perfect right to select that category under which to be listed in the Labor Draft."

"You have, indeed, Altshuler. The thing is this. If you had listed yourself as a steamfitter, or bricklayer, or almost any other trade, your chances of being selected in the lottery would have been small indeed. However, as an IBM punched card tabulating operator, you were in the computer data banks almost alone. All others in that category were older men or women. You, practically alone, are in the age group eligible to be drafted."

Perry Altshuler pop-eyed at him. He said indignantly, "Are you completely around the corner? How can I be selected? There are no punched cards used any more."

The other smiled, a mocking quality there. He said, "Young man, I suspect that you've outsmarted yourself. You see, there are few trades, professions, occupations that go completely out of existence. There are still skilled workers in the United States of the Americas who make bows and arrows, by hand. You can still find cut nails on the market. Buggy whips are still being manufactured, so are hand-made shoes for the sake of unfortunates with deformed feet."

"But the computers use tape these days."

The other shook his head in amusement. "Altshuler, most of the government's accounting is admittedly done by computers utilizing tape and other means of compiling their data banks and files. However, we still have a considerable store of the punched cards used in the old days that haven't had the material on them transferred to the newer data banks. Your record here shows that you claim to be proficient in the use of the Sorter, the Key Punch, the Collator, the Reproducer and the Automatic Tabulator. Very well, Altshuler, you have been drafted to serve on these machines. Your pay will be two shares of Variable Basic a year, payable each year in advance so you'll accrue the dividends as you work."

Perry Altshuler blurted, "I don't want two shares of Variable Basic. I have my ten shares of Inalienable Basic issued me at birth. I've figured out how to get by on it. It takes a little planning but I can do it."

The smaller man looked at him contemptuously. He said, "You young cloddies ought to be ashamed of yourselves. Where in the name of Zoroaster is your ambition? Why, when I was your age, I spent the better part of three years looking for a job so that I could augment the dividends I got from my

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Inalienable Basic. I was able to marry, have children, give them an above average education, as a result. How are you ever going to raise a decent family on the pittance you get without any Variable Basic in your portfolio?''

''I don't want to get married,'' Perry told him. ''Who the hell gets married these days? But if I did, my wife'd have her shares of Inalienable Basic and when and if the kids came along, they'd have theirs and the standard education would be good enough. Now, look here, I don't want this job. I refuse it.''

The other leaned back in his chair, once again, wearily. ''Young man, it is possible for you to refuse this position. However, the government of the Ultra-welfare State has run into these problems before. When People's Capitalism was first instituted, the issuing of Inalienable Basic to each citizen came at the same time that the second industrial revolution, sometimes known as ultra-mation, burst into full flower. Right from the beginning, unemployment and under-employment were everywhere. At first they attempted to spread the jobs around by shortening working hours but there's a point of diminishing returns there. In most industry it is impractical to shorten the working day beyond a certain limit. If you got to the nonsense point of, say, two hours a day, it would be necessary to work twelve shifts if your industry operated on an around the clock basis. The only answer was to allow the technologically displaced worker to remain unemployed, and let those few technicians and skilled workers still required in industry work a normal six hour day, five day week.''

''It's a dirty trick on them,'' Perry muttered. ''Four people out of five don't have to do anything at all, but the one who has the bad luck to get caught in the draft has to work his life away.''

The other said dryly, ''In modern industry, Perry Altshuler, one doesn't exactly work his life away. And, above all, he earns additional shares of Variable Basic which not only augments his own income, and his standard of living, during his lifetime, but can be left to his heirs. But the point I was making is this—the government takes a dim view of slackers and draft dodgers who don't live up to their responsibility when chosen in the labor draft.''

''So what can they do if I simply refuse?''

''Various things, young man. You would probably put in five years on this job. Very well, if you refuse, the government is in a position to tax you during that full five years.''

''Tax me! I can hardly get by now!''

The older man nodded. ''I am sure. But that is the law. As an alternative, you could be drafted into the military, Altshuler. You are of the age and fit the other requirements to make a soldier.''

Perry Altshuler said hurriedly, ''I don't want to be a damn soldier. What sense is there in being a soldier when there aren't any more wars?''

''There is still a military, even though it isn't as large as it once was.''

Perry Altshuler looked surly.

The other said, ''There is one other aspect, young man. Some of the draft dodgers I've come up against are inclined to think themselves a bit on the stute side. They take the position, ah, forced upon them, but they lay down

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on the job, pretending inability to perform to satisfaction. In fact, some even commit minor acts of sabotage. This, Perry Altshuler, is considered criminal action—and we still have a few methods of dealing with criminals in the United States of the Americas."

They processed him, Perry dragging his feet all along the way. He was to work in Central Statistics of the Economic Planning Board and evidently might come in occasional contact with classified material. As such, he had to go through the routine of having his security rating checked. And at that he cursed himself inwardly. Why hadn't he had the good sense while in school up to the age of twenty-five, to join up with one of the crackpot outfits on campus? Why couldn't he at least have signed a couple of peace petitions, or joined a parade of demonstrators carrying signs against this, that or the other aspect of the Ultra-welfare State? No, he had to be out chasing mopsies, or getting drenched on pseudo-whiskey, while the intellectual types were having the time of their lives clashing with the police or heaving tomatoes at politicians.

Not only was there nothing against him in the computer banks to give him a suspicion of subversion but nothing against his father, mother, or any of his grandparents. He cursed them inwardly as a bunch of mollies, without the guts to have had any strong political beliefs. One and all they had fitted into People's Capitalism like a bunch of happy pigs in curd—sitting before their Tri-Vision, drinking beer in the old days and, after Central Production had banned the use of cereals for alcoholic beverages, sucking on this new tranquilizer-euphoric they called trank.

Some relatives!

He wound up, at long last, alone in an office in the Central Statistics Building in the huge pseudo-city that was Greater Washington. He hated pseudo-cities. In the old days, from what he had seen in the historical fiction shows on Tri-Vision, the cities might have been one thing with all the giant skyscrapers, all the individual stores, all the wires strung everywhere for communications, all the traffic and the riots and all. But now, stretched out forever and gone, with the wide avenues, the extensive parks, and so many of the buildings and parking areas, transportation and business, underground, they lacked the excitement of the past. Or, at least, so he bitterly assumed.

And the traffic. Now that must have been something. Everybody had his own car. Some families had two, or even three. Everybody dashing around on manual controls, looking for parking space and all. Now, with the coming of vacuum-tube transport, so that you could get from anywhere in the United States of the Americas to anywhere else, in practically no time flat, who needed a car? A vacuum-tube twenty-seater, or larger, would whisk you from coast to coast in a couple of hours or so. Once to your destination city, you climbed into a two-seater, and dialed the building, and, often, the individual office or home, you wanted and emerged at your exact destination. You didn't even have to park your car and walk up. If for whatever reason you wished surface transportation, you summoned an

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auto-floater and dialed the auto-controls for where you wanted to go—the descendent of the taxi-cab or rented car of his grandfather's day. Nobody owned his own car anymore, or practically nobody; it was much simpler to rent a floater for the period of time you needed it.

He glared around the office in which he found himself. It had been some years since he had worked with them, but they were the old-time IBM machines all right, all right. Two of each; Key Punches, Sorters, Automatic Tabulators, Reproducers, Collators, and one Interpreter. There were also extensive stacks of punched cards, and deep rooms of storage space for blank cards yet to be punched up or duplicated.

Oh, he knew the machines all right. His father had worked alone on a night shift for an insurance company and had often taken Perry down to teach him their operation. He thought he was giving his boy a trade. Perry sneered. He wanted a trade like he wanted a galloping head cold.

He was alone in the office and thus far no one had given him anything to do. In fact, the implication of his immediate boss, James Terwilliger, who had spent less than five minutes making his new operator welcome, had been that there would seldom be anything for Perry to do. He was expected to sit around, on call, waiting for something to turn up.

Six hours a day, in the name of the holy living Zoroaster! and five days a week. What a way to use up your life! How long had that stupid cloddy Herman Banning said? Possibly five years of this unbearably hard labor. Five years! The best years of your life, at that, your youth. It was more than a man could be expected to bear. What luck! What miserable, brutal luck. Selected by the labor draft. One out of ten, perhaps, and it had to be him.

Zoroaster! Was the gang going to laugh!

And what did he get in return? A lousy two shares of Variable Basic a year. Put it in your portfolio, old Banning had said. With the extra dividends that would accrue to his credit balance, he, Perry Altshuler, would have the funds to marry and raise a decent family, complete with a better than average education. Well, that's what Banning thought. He, Perry Altshuler, would cash those Variable Basic shares in as fast as he got them, and blow them in the classic manner. He'd throw some wingdings for the gang that'd set these hard working cloddies like Banning back on their damned heels.

The thought of that placated him slightly. He'd always wanted the wherewithal to take in the big night spots, drink the best lush. Supposedly it was now illegal to use cereals for lush, even over in Common Eur-Asia, but he knew damn well that if you had the dollar credits in your account you could find just where and how to dial to get just about anything. Champagne, Scotch, Cognac, anything.

The door screen lit up and an unknown face was there.

Perry scowled around the desk and finally located the button.

A voice said, "Dan Fellows to see Perry Altshuler. Personal."

Personal? Perry grunted. However, he activated the door. At least it would

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give him something to do besides sitting around thinking about his bad luck.

The other came in and, smiling broadly, hustled over to Perry's desk and stuck a hand out to be shaken.

"Perry Altshuler?" he said. "I'm Dan Fellows."

Perry shook the hand, finally got his own away from the effusive newcomer and said, "Well, I'm glad to meet you. Sit down, Mr. Fellows."

The other was a snappy man of about Perry's own age. Snappy was the only word. Snappy of movement, snappy of dress. Snappy of everything save his eyes which seemed to be somewhat vague.

"Just Dan, Perry," Dan said, finding a chair and pulling it up right across the desk from the other. "We're informal in this outfit."

"What outfit?" Perry said.

"The I.A.U.U."

"What's the I.A.U.U.?"

His visitor chuckled good naturedly. "The Inter-American Universal Union. I'm, well, what amounts to your shop steward. Or, at least, will be when you sign up." Dan Fellows leaned over the desk and dialed on the teevee phone screen. A document appeared in the screen. "Just stick your thumb print right here, that's all that's necessary."

Perry looked at him. He had vaguely heard of the I.A.U.U., now that he thought about it but had never had any interest in the organization. He seldom read anything in the teevee newspapers except the sports and comics.

He said, "What's a shop steward and what am I signing up for?"

Dan sighed, belying his hail-fellow-well-met smile. "The union. I represent this department of Central Statistics. Everybody joins up. I need your thumbprint."

"Why does everybody join up?" Perry said reasonably.

The smiled faded. "Otherwise the union can't use the check-off."

"What's the check-off?"

"An arrangement with the government so that your dues can be automatically taken from your pay."

Perry said, "Look. Let's start from the beginning. I'm not up on all this. This is my first job. What's more, I didn't want it. I was drafted."

Dan Fellows took a deep breath. "Doesn't anybody know anything anymore?" he complained. "Listen, unions are organizations of employees to protect their rights and deal with the boss. All right, so far?"

"I suppose so. It sounds like a good idea."

"Of course it's a good idea. There've been unions ever since men started hiring other men. You have solidarity, you can fight collectively for your rights."

Perry nodded.

The other went on. "In the old days, there were a lot of unions. All divided up and all fighting each other."

"Why?"

The shop steward looked at him, his vague eyes slightly narrow, as though wondering if sarcasm was meant. But then he shook his head, on the face of it deciding that Perry wasn't the subtle type.

He said, "Usually for jurisdiction over this group of workers or that. Obviously, the more workers you have in your union, the more dues. At any rate, in the old days they had the A.F. of L,

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the C.I.O. and a whole flock of independent unions. It was pretty chaotic.''

''I can see it might be.''

''Correct. However, with the coming of the Ultra-welfare State and ultra-mation in every field of industry, there weren't nearly so many workers to join up. Slowly, we amalgamated and particularly after the government took a hand. At any rate, now there's only one union left, the I.A.U.U., and we all belong to it.''

''All?''

The shop steward said, with a dangerous edge in his voice, ''Yes.''

''I haven't met any other employees in this department except Mr. Terwilliger, my boss.''

''He's management.''

''Oh. Well, so you check my dues out of my pay before I ever see it. What do I get out of it?''

''We fight for you. Don't you believe in solidarity, presenting a united front?''

''Sure, I suppose so. I'm not trying to argue with you, just finding out. What do I get out of it?''

''We struggle for better pay for you, better working conditions, shorter hours.''

''I thought all those things were set by the government.''

''They are, in government jobs. But you've got to remember that Damon Footman is ipso facto part of the President's cabinet, and as such is in there pitching for our boys.''

''Who's Damon Footman?''

The other was really irritated now. ''The International Secretary of the I.A.U.U.''

''Oh.'' Perry Altshuler thought about it some more. He said finally, ''What do you get out of this?''

''How do you mean?''

''Why do you go to all this trouble, lining me up and all?''

''For solidarity! We all have to stick together, if we're going to get anywhere. In union there is strength!''

Perry said, ''Oh,'' with an element of relief in his voice. ''I thought maybe you were in it for your own benifit. To pick up a quick buck. What kind of work do you do, ah, Dan?''

''I'm on the union payroll as a shop steward and an organizer.''

''Oh.''

There was a pregnant silence. Finally, Perry said, apologetically, ''What do you make a year?''

The vague eyes narrowed again. ''I could tell you it's none of your business, but working here in Statistics you could find out without too much trouble. Ten shares of Variable Basic a year. . .''

''Ten-shares-of-Variable-Basic!''

''. . . plus expenses.''

Perry Altshuler hissed between his teeth. ''Holy smog. What does this Damon Footman make?''

''Two hundred shares of Variable Basic a year from the union, plus his government salary, of course, plus his unlimited expense account.''

Perry was dazed. He said, finally, ''Look, what happens if I don't join?''

''Are you some sort of fink-scab?''

''What's a fink-scab?''

''Why don't you look it up, hombre?''

On the teevee phone screen, Perry dialed Library, then on the booster, Dictionary. He said into the screen, ''Definition of fink-scab, please.''

A robot voice said, ''1. A worker who refuses to join a union or go on

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strike. Especially a worker who will cross a union picket line to take the place of a striking worker. 2. A worker or private policeman hired by a factory, mine or company to help break a strike. 3. A company spy posing as a worker in order to report union activities. Derivations: Fink was originally Pink, a contraction of Pinkerton, a private police organization. Scab was taken from scab such as covers a sore, a term of deprecation against union foes."

Perry flicked off the set and answered Dan Fellows' question. "I don't think I'm a fink-scab," he said. "But what happens if I don't join?"

"A couple of the boys come around to convince you a little."

"A couple of what boys?"

"We've got a few union employees who specialize in convincing fink-scabs that they ought to join up."

"And get their dues checked off, eh?"

"Yes."

When Perry Altshuler entered Jerry's Joynt that night, a howl of laughter went up.

Jack Simons yelled, "Here comes the conquering—what-ya-callum—*proleetarium*."

Perry Altshuler sank into his usual chair and growled defensively. "Don't think I'm standing still for it."

They howled laughter.

Kurt yelled at him from across the table, "The drinks are on you chum-pal. The drinks are on you. None of the rest of us gentlemen of leisure can afford it, this time of month."

"You can go get spayed."

"Come on, come on," they yelled. "We know the fling. You get your Variable Basic in advance, so all year long you can drag down the dividends. You might as well latch onto it until you figure out some way of getting out from under."

Perry Altshuler didn't actually mind. It was, in a way, a temporary moment of glory. He'd never bought a round of drinks before in his life.

"Okay," he said. "But sea-booze, you bastards."

The groaned in simulated dismay. "We thought you'd spring for pseudo-whiskey, at least."

"Get goosed. I don't have any of those new credits to my account yet." He added, just to get it on the record. "And even when I do I'm not going to blow it buying lush for you cloddies."

"Hey! Cloddies, yet," Jack Simons yelled. "He's too good for us, now he's got some extra dividends."

But there was an edge in the voice, the tone, of Perry Altshuler's closest friend. An edge. Perry looked at him. "Get goosed, Jack. I won't be on that job a week. I'll figure an angle."

"Sure. That's what they all say," Jack told him mockingly.

Somebody else said, "Let's dial this damn drink before he changes his mind, then let's get down to some words of wisdom to get poor old Perry—the silly sap-sucker—out of this here job they drafted him into."

Perry put his Uni-Credit Card in the table's payment slot and dialed eight mugs of sea-booze. He put his thumb on the screen to register his thumbprint.

When the drinks came, one of the group said thoughtfully, "Do you know a doctor real good? Member of the fam-

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ily or something?''

Perry thought about it. ''No,'' he said.

The other said, ''Well, if you knew a doctor you could get him to give you something to make your heart act up, then you could get a discharge. I've heard some guys who get drafted pull that one.''

Jack Simons said in disgust, ''Yeah, and then if the john-fuzz catches up with you, both of you get it in the ass for conspiracy to avoid the Labor Draft.'' He looked at Kurt. ''Tell Perry about that guy that got out when you were working on that solar power installation down in Mexico.''

Perry looked at Kurt. ''I didn't know you were ever drafted.''

Kurt shifted his shoulders, as though embarassed. ''It was only for eight months.''

''What category were you?''

''Laborer,'' Kurt said. ''I thought that was one category that was so full they wouldn't take me in a hundred years. But just by luck, I got it in the lottery.''

''Laborer?'' somebody else said in disbelief. ''You don't mean to tell me that they put up things like solar power plants with physical labor?''

Kurt said defensively, ''No. But the thing is, on a job like that, way the hell and gone up on top a mountain, they have little odds and ends jobs that actually need muscle some time. Moving things around here and there and stuff. What you're doing is kind of stooging for the engineers and technicians. You don't do much but when they want you, they need you.''

Perry said, ''Well, what'd this cloddy do to get out?''

Everybody fell into an interested silence while Kurt explained. No man present but realized it might happen to him. Given god-awful luck, it might happen to him. They spent a good deal of their conversation, day in and out, going over how to avoid the labor draft.

Kurt said, ''He played it stute. When they first drafted him, he put up no fling at all. Acted like he *wanted* to work and make his extra Variable shares. But then when he got up to the camp where they were housing us during the construction, he started in.''

''Doing what?'' somebody said, in fascination.

''After work, he'd hang around the men's shower trailer, watching the other guys take showers. He'd kind of stand around with a kind of vague look on his face, like.''

Jack Simons laughed.

Kurt said, ''So after about three or four days of this, the doc had him drop in to the camp medic trailer and he says to him, 'Jimmy, how do you like girls?'

''And Jim kind of thinks about it for awhile and then says, 'Oh, I guess they're all right.' ''

Everybody laughed.

Kurt wound it up. ''And before the day was out, old Jim was on his way back home with a medical discharge and that was the end of his working career.''

Perry said, ''The trouble with that one is I'm working in an office. There is no shower room, even if I did want to pretend I was a molly. Besides, I don't think they'd care.''

''Yea,'' Jack said. ''It'd be one thing out on a construction job with nobody but men. But nobody cares in a office

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any more."

The others fell into a babble of exchanging ideas on how to avoid the labor draft.

Perry turned to Kurt and said, "What'd they pay you?"

"I got one share of Variable Basic."

"How much does it pay off?"

"Oh, several hundred dollars a year at least. According to what the fluctuations are in the dividends. But I traded it in."

Perry was interested. "What'd you get for it?"

"Over four thousand dollars."

Perry pursed his lips. "Holy smog. What'd you do with it?"

"I blew it. What'd ya think? I went over to Hawaii and stayed until it was all gone. On the beaches and all. You oughta see those Hawaiian mopsies, part Polynesian, part white, part Chinese or Japanese. Hombre, believe me, those are *mopsies*."

Perry said, "Zoroaster! I'd think it was almost worth it. Eight months, eh? Then what happened?"

Kurt said, his tone suggesting that possibly he wouldn't be believed, "The job was over and they didn't call me up for any more. But I had such a good time, over in Hawaii, I let 'em know I was available."

"You *did*?"

"Yeah," Kurt said, grunting self-deprecation. "I would of liked to of done it, say, once more. Have one more big blowout like that."

"Well, you could of applied to some private outfit. This is People's Capitalism but it's still capitalism and the hundred biggest corporations the government dominates aren't the only enterprises in the country."

Kurt shrugged. "Like practically everybody else in our gang, when I was in school I made sure to take subjects that wouldn't wind up with me knowing something that'd lead to a job. When I graduated, the only thing I was fit for was laborer. It's the biggest category of all, unskilled labor, and the least needed. Anyway I looked around a little after the Mexican job, and after Hawaii, not trying too hard, but there wasn't anybody who needed laborers and I went on back to living on my Inalienable Basic dividends."

Somebody from across the table called to Perry, "How about another round, rich man?"

"Get spayed," Perry said back. "I'm hoarding those two shares of Variable I'm going to get until my first vacation. Kurt, here, has given me an idea. I'm going to throw the biggest blast since Hiroshima." He took a pull at his drink and added, "I've got to get something out of this lousy luck."

Three days later, Terwilliger came in and gave him an assignment. There were some files of Internal Revenue cards back in one of the storerooms that he wanted gone through and all bearers of Social Security numbers below a certain figure sorted out. Then he wanted a list of these run off on the tabulator and a total of how much income the bearers had made during the Asian War. The cards were then to be returned to the master files.

Wondering vaguely who in the world would want such a report, Perry Altshuler brought forth the boxes of cards involved and took them into his ma-

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chine room.

Old man Terwilliger, he decided, knew precious little about IBM punched card machines. There were about a hundred thousand cards to deal with but if his immediate superior thought he was about to sort them down by Social Security number, he could think again.

Perry took out the wiring board from one of the Collators and picked up a handful of jack plugs and wires and began setting the machine up to throw out any cards below the number Terwilliger had given him. While he was at it, he rigged the machine to check sequence on the master file.

He returned the board to the side of the Collator, switched power alive on the machine and took up his first handful of cards. He riffled them several times, then joggled them carefully, since they were in none too good shape, after all the years, and stuck them in the bottom feed hopper. He pressed the start button and watched for a moment as the cards fed rapidly through. From time to time, a card was ejected. He brought them forth manually and checked. The machine was working all right. The ejected cards were all of the category on which Terwilliger wanted the report.

He turned to go to the other Collator to set it up as well, but just then his first machine threw a red light and stopped. He scowled and checked. His file of cards was out of sequence. He brought forth the offending card, checked it and inserted it where it belonged. He pushed the button which turned the red light off and started the machine up again.

Then he turned to the other Collator and set it up. By the time he had it operating on the second half of his master file, the first machine had thrown another red light and stopped. Another card out of sequence. Whoever had last worked in this department had evidently let the punched cards get badly out of correct filing order.

You can't work with a file of IBM cards that are out of sequence and he wondered for a moment if he should begin the operation of resorting the whole shebang. But he shouldn't have to do that.

Instead, he went back to the first machine and rewired it to drop cards out of sequence into the reject hopper, rather than stopping and throwing a light. Then as the cards flicked through, he refiled them manually and as the hopper filled with cards that had gone through correctly, took its contents to the second machine for Terwilliger's operation.

As the second machine began to throw out its selected cards, Perry went to the Automatic Tabulator and set it up to run the list and totals Terwilliger wanted.

About three hours later he left his own office carrying a sheet of paper perhaps two feet wide and a yard deep and approached the door of his department head. He activated the door screen and stood there.

Terwilliger's voice said impatiently, "What is it?"

"The report."

"What about the report? I'm busy. I thought you understood those machines, Altshuler."

Perry took a breath and said, "The report's finished, I meant."

"Finished! Come on in."

The door opened. Perry, bearing his

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sheet of paper, entered. He crossed the room to his superior's desk and laid it there before the other.

James Terwilliger was an efficient, bustling type, unbeloved by both inferiors and his own superiors. However, there were seldom complaints about the work emanating from his department. Now he scowled down at the report Perry had brought him.

"Are you sure about this?"

"Sure," Perry said, mildly surprised at the other's surprise.

"You mean to tell me you sorted a hundred thousand cards through nine numbers and then ran off this report in less than four hours?"

"No, sir," Perry said. "I ran them through two Collators and pulled the numbers you wanted. It's faster. By the way, I ran a sequence check while I was doing it. That file was badly out of sequence. I don't know about the others back in the stock rooms, but whoever handled these cards last was a real cloddy."

Terwilliger looked at him for a long, thoughtful moment. He said finally, "The last punched card operator we had knew how to operate only the Key Punch, Sorter and the Tabulator, and she wasn't very good at the Tabulator. What's a Collator?"

Perry said, "It's a machine that'll merge two files of cards together, putting them in proper sequence. Or it'll check sequence on a file. Or it'll pull certain cards out of a file. For instance, suppose you had, say, twenty thousand cards representing twenty thousand people and, for whatever reason, you wanted to pull the cards of all Negro women above the age of forty who had better than a high school education and were born in the North. You could wire the Collator to do that, always assuming, of course, that the information was punched into the card."

Terwilliger ran a hand over his mouth. He muttered, "I know damn well those cards are in a mess. I've been putting off doing anything about it, but sooner or later I've got to get that information off the cards and into the computer data banks."

There wasn't anything Perry could think of to answer that.

The department head looked at him. "Do you know enough about those damned machines to train somebody else to operate them?"

Perry said, "Why not?"

"How long would it take? Six months, or so?"

"I'd say a couple of weeks or so. You can learn the Sorter in less than a day. Or the Reproducer or Interpreter."

"What's a Reproducer and an Interpreter?"

This character obviously knew nothing whatsoever about the antiquated IBM machines, Perry decided. He said, "A Reproducer takes the information off one punched card and reproduces it on another. That model in there will do it at the rate of about a hundred a minute. The Interpreter reads the holes and prints the information in them, both alphabetic and numerical, on the top of the card where the operator can read it."

"How about the other machines? How long does it take to learn to operate them?"

"For plain, ordinary operating, any averagely intelligent person can learn

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them all in a couple of weeks. Learning to wire them for different operations takes a bit more time. And the longer you work the better you get at it. My old man was an expert and he spent a lot of evenings showing me how."

"So, if I got you a couple of workers, you could teach them the fundamentals in a couple of weeks and you could supervise the rest of it? The wiring and so forth."

"I suppose so."

"What're you being paid?"

"Two shares of Variable a year."

"What's your category, IBM Tabulating Operator?"

"That's right." Perry Altshuler was mystified.

"You've just been promoted to Junior Tabulating Supervisor and your pay. . ." Terwilliger flicked on his desk teevee phone screen and said into it, "What is the pay of a Junior Supervisor?"

A robot voice said, "Three shares of Variable Basic a year for the first year, four shares a year for the second year, five shares a year for any following years of service."

When Perry Altshuler got back to his mini-apartment that evening, he was still in a half daze. It didn't take much work with a stylo to figure out that if his job held for three years and he saved his shares of Variable Basic and put them into his portfolio that his income would more than double.

He went into the tiny auto-kitchenette and on the table screen dialed first beverages, then alcoholic beverages, then pseudo-whiskey and gingerale. If he had known how to go about dialing Scotch or Champagne he would have. He'd have to find out about that, he decided. He had never tasted Scotch, but he had heard about it.

He took his glass back into the living cum bedroom and sank down into his comfort chair.

Double his income in three years. And if he actually stayed on for five years, as that Herman Banning character at the Bureau of Labor Draft had suggested he might, it would mean twenty-two shares of Variable Basic. Even if he traded two of them in for cash to blow on a supreme binge or two, he'd still have twenty left to add to his ten shares of Inalienable Basic. Thirty shares of United States Basic Stock. You could just get by on ten, but *thirty*! He'd live like a god, like the upper class. Life would be one continual vacation. Trips abroad, a boat on one of the lakes, or down in Florida, fishing trips, fishing equipment. Holy Zoroaster!

His door screen lit up and there was the face of a stranger there. Well, not a complete stranger. Perry could vaguely place the other man.

He activated the screen and a voice said, "Marvin Brunner, calling on Perry Altshuler."

Perry could have asked him what he wanted, but he activated the door and said, "Come on in."

The other was a tall customer, a few years older than Perry, and on the lanky side. His face was long and there was a wry something. He held out a hand with more than averagely long fingers and said, "We don't know each other but I live in the same highrise here."

Perry said, "Oh, yeah, that's where

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I've seen you, around in the halls from time to time." He waved to the couch which, save for the comfort chair, made up the only seating in the mini-apartment. He indicated his glass. "I've been sitting here alone, having a little celebration."

The newcomer looked at him quizzically, even as he lowered his long form onto the couch-bed. "Celebration? These days, most put up a howl when the labor draft hits them. I'm afraid the Ultra-welfare State has turned a lot of our people into bums."

Perry said, "How'd you know I've been drafted?"

"Let's say the grapevine told me," Marvin Brunner became suddenly more serious. "Been approached by the I.A.U.U. as yet?"

"Why, yes." This cloddy seemed to know a lot about Perry's business.

The other fetched a slip of paper from a side pocket and looked down at it. "Probably Dan Fellows, eh?" Did he threaten to send around a couple of his goons if you didn't join up?"

"As a matter of fact, he did." Perry felt he should be irritated at the other but in spite of himself his tendency was to like the laconic Brunner.

Brunner looked at him, tilting his head a bit to one side. "The I.A.U.U. isn't the only union in the country, you know."

"It isn't?" Perry was surprised. "Dan Fellows said it was."

"He wishes it was."

"He said there was just one union now and that its International Secretary, Footman, or whatever his name is. . ."

"Damon Footman," Brunner nodded, his expression bitter.

". . .is even on the President's cabinet."

Brunner nodded again. "Long since, the national government has seen the value of Footman's type of unionism. Let me give you some background, Altshuler."

Perry shrugged and took another pull at his glass. "All right, let's have some background." He didn't offer the other man a drink. Long years of watching every penny of his dividends from his Inalienable Basic had stifled whatever instincts of generosity with which he might have been born.

Brunner thought a minute and then said, "The basic idea of unionism is a good one. The working man, in the early days, got together with his fellows in the attempt to get a larger slice of the cake and to better the conditions under which he labored. It was a natural tendency. And just as natural was the early reaction of the owning class. They did everything they could to combat the forming of unions. In the early days in this country, sometimes pitched battles were fought, with hundreds of men on each side, between union and company. I won't give any specific examples, but there were many of them, particularly during the forming of the mining unions in the West." The long face twisted sourly. "In those days the companies didn't know what side of their bread the butter was spread upon."

Perry said, "How do you mean?"

"I mean that it's to the benifit of what we now call management to have unions of the type that were then forming."

"Well, why? You used the example of the union wanting a bigger slice of the cake. Well, a cake's just so big. If

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the employee gets a bigger slice, then the company owner gets a smaller one."

Brunner grinned. "The class struggle summed up very neatly," he nodded. "I'll get to it in a moment. But let me go on with my background. The early unions were small affairs, organized on a craft basis, that is, you'd have a plumber's union, a carpenter's union, a bricklayer's and so forth. The employers bucked them and, when possible, called on the government to help. Time after time, in the history of the 19th Century, the National Guard was called out to help break a strike, protect the scab-finks, arrest the picketeers, and so forth. The early union organizers were usually dedicated, sincere and selfless men, largely motivated by high ideals."

"You mean like Dan Fellows?" Perry said sarcastically.

"We're coming to that," Brunner grinned, his mouth sour. "Toward the end of the 19th Century some changes began to manifest. Industry was getting larger, and so were unions. Organizations such as the Knights of Labor, the Socialist Trade and Labor Alliance and later the IWW, came along. Large unions of unions were what they were and still led by idealists such as DeLeon and Debs. But another thing was developing at the same time. You see, unionism became big business. Having hundreds of thousands of dues-paying union members meant millions of dollars and where there are millions of dollars involved, there are men attracted to it who are motivated by less than idealism."

"You mean like Dan Fellows?" Perry repeated.

"Exactly like Dan Fellows and like Damon Footman, for that matter. Unionism became big business and, like any other big business, it came to be operated for the profit of those who controlled it. Union heads got to the point where they were being paid as much as the general managers of the nation's largest concerns. In many of the unions, gangsters moved in and took over, their strong arm men taking care of any of the rank and file who protested—or who refused to join up."

"Like Dan Fellows' goons."

"A comparatively gentle example," Brunner nodded. "However, something else was also developing. Remember that in the old days the employers bucked the forming of the unions, but that was when industry was comparatively small and uncomplicated. As it got larger, a new problem reared its head. A manager of a plant, who has to look ahead as much as years, could line up all of his raw products but one. He could contract for and schedule delivery of everything he needed—save labor. He'd be going along fine, meeting his schedule, satisfying his customers, living up to his contracts, when, bang, his labor would walk out on him in a strike. If they walked out at just the right moment, they well might have him over a barrel and he'd have to pony up their demands.

"Okay. It soon became obvious that a well-organized union, well-disciplined, was to the advantage of management. You had somebody you could work with, somebody you could sign a long term contract with to insure the labor supply. You wanted a strong

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union leader who would stick to his contract and ban wildcat strikes, keep his dues-payers toeing the line. In return, of course, you gave him a helping hand, such as the check-off, which enabled him to shake the membership down without too much effort. The closed shop was another little way in which management could help out the labor leaders, for services rendered. You couldn't have a job unless you joined the union."

"Sounds like a racket," Perry said.

"Well, perhaps it wasn't all bad. In order to keep in the saddle the union bosses had to give out a bit, to keep the membership from revolt. So periodically they'd get together with management and make arrangements for increases in pay, shorter hours, or whatever. In short, reforms to keep the rank and file from putting up too much of a howl."

"I don't see what I can get out of my I.A.U.U. membership," Perry said. "They can't get me higher pay. The government sets it."

"The government saw the handwriting on the wall quite a while ago. In the early days of unionism, it stood aside and let labor and capital fight it out. But later it became obvious that such chaos was impractical in a highly industrialized society, so government stepped in and passed a lot of new laws regulating the relationship between labor and management. Cooling off periods before you were allowed to go on strike, arbitration, that sort of thing. There came to be a Department of Labor and a Secretary of Labor in the cabinet of the President. And today the International Secretary of the I.A.U.U. sits on the cabinet as well, supposedly working away at reforming the Ultra-welfare State for the benefit of the nation's employees."

Marvin Brunner came to a halt and looked at Perry Altshuler. He took another deep breath and said wryly, "Which brings us to the present and the other union I was talking about."

"I never heard of it," Perry said. His glass was empty and he considered dialing himself another drink. However, as yet he hadn't received any dividends from his new Variable Basic stock and his credit balance must be scraping bottom. He put it off.

Brunner said, "It doesn't get a great deal of publicity on Tri-Vision, teevee newscasts, or wherever. You see, its purpose isn't exactly compatible with the institution of People's Capitalism."

"How do you mean?"

"Perry Altshuler, this country is in an unhealthy rut. It's going to make some basic changes or its's going to degenerate into one of the most sickening societies since the last couple of centuries of the Roman Empire. With the people as apathetic as they are today, what with their free Inalienable Basic handouts, their Tri-Vision nonsense entertainment, and now the coming of trank to keep them bemused, it's hard to drum up enthusiasm for anything that might upset the applecart. But the changes are crying to be made, and some of us are heeding the cry."

He seemed to switch subjects. "There is no law in the Constitution of the United States of the Americas that prevents fundamental change, call it, if you wish, revolutionary change. When the majority of the voters wish to make any

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change in our institutions they may, even up to and including a complete abolition of People's Capitalism, the Ultra-welfare State and the Constitution itself."

"Holy smog," Perry blurted. "Is that what you're asking for?"

Brunner nodded. "In fact, it is."

"And you think you can talk the majority of the people into voting for you?"

"We hope so."

"Well, you're a bunch of dreamers. The minute you people, whoever you are, get the majority to vote for you, the bigwigs will order out the army, and the john-fuzz and the marines and all the rest of their muscle and shoot you silly."

Marvin Brunner grinned suddenly. "That's where the second union comes in."

Perry blinked at him. "What do you mean?"

"Altshuler, in this age he who controls manufacturing, agriculture, communications, transportation and distribution controls the nation. Wasn't it Napoleon who said an army marches on its stomach? Well, carry the idea into the modern age. Voting alone admittedly wouldn't guarantee you'd get what you voted for, if it rubbed as against the grain of the bigwigs as you called them, as a complete overturning of their society. You'd have to have something to back up your vote. If you were in complete control of the means of production, communication and transportation, you'd have that power. That's where the second union comes in, Altshuler, and that's why I'm here tonight."

That curve had been thrown a little quickly. Perry said, "Well, why? I've been letting you bend my ear for the past fifteen minutes and I still don't know why you're here."

"To recruit you into the union whose sole purpose for existence is not to get immediate higher pay, or better working conditions, but to back up the ballot when the majority of the people vote to end People's Capitalism and get back on the road to progress."

"And to check off more of my pay?" Perry said bitterly.

The other laughed. "No, not that. No dues. Hard work, possibly, helping to recruit others, but no dues. You see, Altshuler, I'm the organizer in this vicinity. When we learned that you had taken a job, I immediately contacted you. To put this over, we need every useful employee in the country to back us."

There was a plaintive note in Perry's voice. "I don't even know what you stand for."

His visitor brought a pamphlet from his pocket and flicked through the pages. "Ever read Edward Bellamy's *Looking Backward*?"

"Never heard of it."

"It's an old novel about a guy who travels forward in time, is what it amounts to, from the end of the 19th Century into the 21st Century. There's one passage in it in which he describes the socio-economic system of the 19th Century as a coach on which a few ride in the high seats, high above the dust and in comfort. But the majority are down on the rough and rocky road, pulling the coach. The driver is hunger and he is continually lashing those who pull.

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Everyone is trying to get up off the road into the seats but few succeed, and, from time to time, someone falls off the coach and immediately has to grab one of the ropes and help pull."

Marvin Brunner came to his feet and looked down at his host earnestly. "Perry Altshuler, time has marched on. Today that coach is powered, it even has an automatic driver, it's no longer necessary to whip the poor cloddies pulling it. The road is smoothly paved and there's room on the top of the coach, in the seats, for everybody. All we have to do is realize it."

He took a couple more pamphlets from his pocket and tossed the lot onto the small table next to Perry's comfort chair. "I wish you'd read these."

Perry frowned at the booklets. "If I wanted to read them, why not just dial them on the teevee phone screen from the library banks?"

"Because they're not in the library banks."

"Not in the library banks? Everything is in the library banks."

Brunner shook his head. "You see, these are a bit on the frowned-on side. I am a Futurist, Perry Altshuler."

One of them was named Mary Ann Sward and the other was named Mary Lynn Jones and, for the first time in his life, Perry Altshuler was customarily called Mr. Altshuler. Somewhat to his surprise, both women seemed glad to have been called up by the labor draft. Both welcomed the opportunity to add Variable Basic to their portfolios. Both were in their early twenties, and Mary Lynn Jones was married and anxious to apply for permission to have a child as soon as she and her husband had a bit of extra stock to help out with the added expenses.

Mary Ann Sward, a trim blond, was the sharper as well as the prettier of the two, but Perry played no favorites. They were on the payroll as Junior Tabulating Operators, but neither knew the difference between a punched card and a sorting needle. He started them right off on the very foundations of the electric accounting system which had come down from the early days of IBM.

He explained what a card was. How you could put both numerical and alphabetic information into it on a Key Punch. Then he taught them how to use both a manual and an electric Key Punch. It was his own weakest link in knowledgeability of the machines. In the old days, key punching was largely in the hands of highly trained women who became dexterous only with time. He could operate the machines but only slowly. Within days, both of the women had surpassed him.

He went on to the Sorter, the next most basic machine and showed them how to riffle cards to take out the static electricity, and then to joggle them into even alignment to get them into the Sorter's hopper. The cards were old and on the worn side and he began to see why James Terwilliger had put off for so long extracting the information they held and getting it into the much more modern computer data banks. Time and again a card would fail to feed through, would tear, and result in the shredding of half a dozen other cards before the machine could be stopped. Then it was a matter of one of the girls taking the torn cards over to a Key Punch and du-

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plicating them. Tedious work.

The stacks of filed cards back in the storage rooms were more extensive than he had first realized and most of them were from Internal Revenue and dated back to the Asian War period and immediately afterwards. Back to the days when the national computer system was in its infancy.

From time to time in the two or three weeks that Perry spent breaking in the new girls, Terwilliger had additional minor reports for them to run off. When the department head entered the IBM rooms he seemed increasing impressed and increasingly relieved by the fact that at long last he had somebody on hand capable of bringing some order out of the chaos that had applied in this section.

Perry, rooting around in the stock and storage rooms, came to the damnedest feeling that the cards wouldn't possibly be out of sequence to this extent by usual procedure. He got the feeling that someone had deliberately tried to throw the cards out of correct order, and whoever had done it had known precious little about punched card accounting. A pro, bent on minor sabotage of this type, could have done a superior job.

However, it was none of his business. He was beginning to get a certain amount of kick out of the job, the teaching of his willing helpers and his position as their superior. They'd been with him almost a month before he approached Terwilliger in the other's office.

Perry said, "One of the Automatic Tabulators is acting up. Where do I get a repairman?"

"Can't you repair it?" Terwilliger scowled.

Perry shook his head. "In the old days, IBM never sold these machines, they only rented them. Part of the deal was they kept them repaired. They had special repairmen who took a dim view of any of the operators messing around with the innards of the machines."

"I'll check with IBM," Terwilliger said. "We've got to keep the damn machines going long enough to get those storage rooms cleared of every item of information in them."

"You're the boss," Perry said and left.

Later, Terwilliger came back to the machine room, frowning. He said, "I got in touch with IBM. They don't make these things any more."

"I could have told you that," Perry said.

Terwilliger said. "I've laid it in the lap of the Bureau of Labor Draft. They're going to see if they have any former repairmen in their files."

Perry said doubtfully, "He'd be pretty old. Too old to be eligible for the draft."

His superior said, "Some of these older people are keener to take a job than the young cloddies the nation is breeding these days. They don't look forward to an old age supported by only ten shares of Inalienable Basic and want to accumulate a few shares of Variable to help out. See here, you need a repairman. Who else?"

"It's according to what you want done and how much time you want spent doing it."

"Shortly, I'm going to have you begin running the reports I've needed for

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several years and have been putting off."

"Well, unless we're going to spend the rest of our lives on it, you ought to have two or three Key Punch operators. As it is now, we three spend half of our time at the Key Punches duplicating torn cards. I've been using the Mary Ann and Mary Lynn to check sequence on the files and get them into the order they're supposed to be in and aren't. But most of the time they're Key Punching."

Terwilliger thought about it. "Three Key Punch operators, eh? How about some more personnel to train as operators?"

"Unless you get more machines, we don't need them. We've got enough manpower to operate these we have."

Terwilliger bent over the teevee phone screen on Perry's desk and dialed and said, "I want to requisition, in addition to the IBM repairman, three IBM Key Punch operators to be assigned to Junior Supervisor Altshuler."

A robot-like voice said, "A Junior Supervisor is restricted to a staff of five persons. Request conflicts with procedure."

Terwilliger rolled his eyes upward in annoyance. He dialed again and said into the screen, "I want to register a change in classification from Junior Tabulating Supervisor to Senior Tabulating Supervisor, involving Perry Altshuler."

It was two days later that Dan Fellows showed up again.

He was as effusive as before and, as before, Perry had to rescue his hand before the other shook it off completely.

Uninvited, the union organizer sank into a chair and let his eyes go about the office. "That's what I heard," he said. "You're really getting busy around here. Later, I'll come around and line up the women."

"The more dues the merrier, eh?" Perry said.

Dan Fellows looked at him but he said, "Actually, that's not the reason I came. You're getting up in the world, Perry. The big fellow wants to see you."

"Who's the big fellow?"

"The old man himself."

"I know that sooner or later I'll find out who you're talking about."

The union man said, "Damon Footman. Damon Footman himself, the International Secretary of the I.A.U.U."

Perry eyed him blankly. "Why in the hell would be want to see me?"

"Damn if I know. I didn't know he knew you existed."

Perry said, "I'm surprised he knew you exist. With a union that must have tens of millions of members, how can he know a shop steward?"

Dan Fellows shrugged it off without answer and came to his feet. "What do you say we run along? A man like Footman expects cloddies like you and me to hop when he calls."

Perry said, "These are working hours. I can't just walk out of the office."

Fellows chuckled as if the other had made a joke. "He's a cabinet member, Perry. Ranks right under the President. Besides, I cleared it with Terwilliger for you."

Instead of taking a two-seater vacuum vehicle from one of the terminals right in the building, Dan Fellows walked

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him out to the street where a private floater was parked at the curb.

Perry Altshuler was mildly surprised. He had never been in a privately owned floater before. There weren't many. Who wanted the bother of a floater of his own? You had to garage them, in a day when living quarters were getting smaller and smaller, you had to park them, you had to maintain them. It was much easier to dial one, on your wrist teevee phone, any time you needed such a surface vehicle, and keep it only so long as you still required it. It was easier, cheaper.

However, this one was not only privately owned, and the swankest Perry had ever seen, but had a uniformed chauffeur seated behind his manual controls. He hopped from his place at their approach, clicked heels and swung the rear door open for them. Perry Altshuler was impressed. Dan Fellows took it in his stride.

Evidently, the chauffeur already had his orders. They took off without the need for instructions. On their cushion of air they proceeded down to the Potomac and then out upon that stream and then up it.

Perry said, "Where are we going?"

Dan Fellows said, "To see Mr. Footman."

"Where's his office?"

"We're going to his home."

They proceeded up the river for about twenty minutes, under manual control, and then left it to emerge on the most spacious lawn Perry could ever remember having seen, even on Tri-Vision shows. The floater approached a fabulous entry, halted and settled.

The chauffeur bounced out, clicked his heels and smartly opened the door. Perry and his guide issued forth and started for the entry.

There were two very neat, very expensively suited, very alert of eye, burlies there. They evidently knew Dan Fellows and nodded to him, without words. The newcomers came to a halt and the obvious guards approached them and began to touch Fellows and Perry here, there, the places a man carried a weapon.

"Hey," Perry said, taking a step backward.

"Orders," the guard who was frisking him said. "Rules are, nobody gets to see Mr. Footman without being searched."

Perry said sarcastically, "Doesn't he trust his dues-payers?"

Nobody answered that and, the search over, Dan Fellows led the way to the door and then through it.

As the lawn, save in Tri-Vision shows, Perry Altshuler had never seen a layout remotely as ostentatious as this. It literally reeked of wealth. As they plowed through the rug that sank half an inch or more beneath their shoes, Perry decided that every painting on the wall must be an original, all preceding the period when the art of duplication became such that even a painter couldn't tell his original from the copies offered the public. Why . . . why some of these must be Rembrandts, Renoirs, old masters of the Florentine school and what else, Perry Altshuler lacked the background to know. He had taken art appreciation courses in school—one of the subjects unlikely to lead to future employment—but hadn't paid too much attention.

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He said from the side of his mouth to Dan Fellows, "It's a good business to be in."

Dan Fellows smiled at him.

Perry said in awe, "It must take a dozen servants to run a place like this."

His guide laughed again. "I'll bet the old man wished he could run this place with a dozen servants. He probably has that many gardeners alone. This isn't exactly an auto-mini-apartment, Perry."

The idea came to Perry Altshuler that he had been brought here, rather than taken to an office in Greater Washington, to be impressed. Very well, he was impressed. But why go to the bother?

They finally wound up before a door and Dan Fellows stood before the screen and activated it.

Shortly it opened and the union man ushered Perry in.

They stood in an enormous escape room. And once again it was a first for Perry Altshuler. He had seen the escape rooms of the upper class homes portrayed in shows, but he had never been in one of these retreats of those who wished to get away from the bother of teevee, phones, and other noises and distractions of daily life that were the bane of modern existence.

There was everything for the comfort and luxury of a hedonistically inclined man, up to and including the first private bar Perry Altshuler had come up against. It would seem that an auto-bar was beneath such as Damon Footman.

Damon Footman—it could only be Footman, obviously—stood at the bar now, three glasses before him. He had a liter sized bottle in his right hand and grinned in their direction and said, "Cognac and soda at this time of the day? Or would you rather have whiskey, Dan? Perry?"

It was the time to be an opportunist. Perry Altshuler said, "Scotch for me, if you don't mind."

Dan Fellows said, "The brandy is fine, sir."

Damon Footman was a stereotype of a politician. He was a bit younger than Perry had expected, probably in the vicinity of fifty. He was beautifully, albeit informally, attired and his skin shone with both health and the obvious care of an accomplished masseur. He was ever at ease and seemingly his two visitors were to be numbered among his close friends.

He said to Perry, "Glengrant do?"

Perry Altshuler have never heard of Glengrant nor any other brand of Scotch for that matter but he said, "Fine."

The union head brought the drinks over, handed them around, held his own at half mast and said, "Cheers, boys."

He waited until they had both taken swallows before shaking hands with Perry. His handshake was exactly right, his palm dry, warm and hearty. He said, "Sit down, boys. Pleasure to see you both."

He conducted them to comfort chairs.

Damon Footman beamed at Perry Altshuler. "I'm told you're stute, ambitious and aggressive. That in a matter of weeks you've bounced yourself from a minor position to Senior Supervisor of your department."

Perry was taken aback. "I don't exactly have a department of my own. I work under James Terwilliger who has one of the minor departments in Central Statistics."

Footman beamed at him and shook

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his head negatively. "I'd call yours a little sub-department all of your own. The last of the IBM installations, eh?"

Perry said, "Look, I get the impression that I'm here by mistake. All I am is an IBM operator who was promoted because there was nobody else around who could still wire a Tabulator or Collator."

Dan Fellows chuckled softly.

Footman looked at his underling. "Modest, too, eh? A virtue you don't see much of these days."

Perry gave up. He waited for whatever was coming.

Damon Footman put down his tall glass, hardly touched, and became brisk. "Perry," he said, "I like to see stute, alert young men in our organization. We need them." He paused and then added, deliberately, "Especially do we need them in communications and statistics and in the Economic Planning Board in general."

He still hadn't said anything that made any difference to Perry Altshuler.

Footman turned to Dan Fellows and said, "Dan, I want you to make arrangements to switch ten shares of Variable from the union's funds to our friend Perry, here."

Perry Altshuler's eyes bugged.

"Yes, sir," Dan Fellows nodded.

"But *why*!" Perry blurted.

Damon Footman turned back to him. "Because we want you on our team, Perry. My boy, I've had you checked in every manner it is possible to check a man under the Ultra-welfare State. Every bit of information in the computer banks, since before your birth, right on through. I probably know more about you than you do and what I've learned tells me I want you on my side."

"What side is that?"

"I'm glad you asked that, Perry, because it shows thinking. Yes, indeed." The union leader took up his glass again and took a small sip of the ancient brandy. He put the glass down and looked earnestly into Perry Altshuler's eyes.

He said, "Perry, this great land of ours is in a condition of flux, unrealized, perhaps, by some. But probably in the comparatively near future some very basic changes will take place."

Dan Fellows nodded, very seriously, in support.

The labor leader went on. "The changes that you've seen even in your lifetime bear out what I'm saying. You see, Perry, our socioeconomic system has evolved into what we now call People's Capitalism, or the Ultra-welfare State. But the thing is that our *governmental* system is still largely that which was established by Jefferson, Washington, Madison and the other great patriots of our beloved land in the latter part of the 18th Century. In short, it's an anachronism."

Perry Altshuler didn't know what an anachronism was, but he could guess. He took another pull at his drink. He didn't like Scotch as well as he had always thought he would.

Footman said, "To take you through some recent history, recall that when the government first established United States Basic Common it did so by taking from the one hundred largest corporations in the country ten percent of the taxes due that year in the form of their common stock. This was merged into what amounted to a gigantic mutual

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fund and the government utilized it first to back the dollar, in place of gold, and in following years as Inalienable Basic to issue to each citizen to achieve womb-to-tomb security. Very well, at first this had comparatively little effect upon the workings of our economy. But as time went on, and each year the federal government continued to take ten percent of its taxes from these largest corporations, in stock, it began to own sizeable portions of the land's basic industries.

"Some, predictably, raised the cry of creeping socialism, however, there was no alternative. As society develops, it is inevitable that the State assume the direction, and sometimes even outright ownership of certain basic industries. An example was the post office. In the early days of our great nation, the mails were in the hands of private enterprise. The famed Pony Express, for instance, was private. For that matter, in our early days bridges and even roads were often privately owned and tolls charged to use them. However, efficiency calls for such institutions as post offices, bridges and roads, and even airlines, railroads and communications to be either government owned, or strongly controlled."

Perry said, "Well, I suppose that makes sense."

Footman said, "Of course. But admittedly, when the government took over common stock in the big corporations it was to back the dollar during the gold drain. It had no intention of taking over the domination of private industry. That evolved." He took another tiny sip of his drink. "Until today we find that the government of this, our great land, is the biggest capitalist under People's Capitalism."

He waggled a finger negatively. "Private enterprise we still have. Indeed, a considerable amount of the stock in the largest corporations is still privately owned, but every year that goes by, the government's percentage gets larger. It is something like the Church during its period of domination of Europe during the Middle Ages. Feudalistic lords originally owned the lands but from time to time when one died he would leave part of his property to the Church, in hope, presumably, of, ah, greasing his way into paradise. The Church, of course, never dies and it never leaves its lands to someone else. As the centuries passed it came to control the greater part of the lands of Europe."

Dan Fellows said dryly, "And it took the Reformation and revolution to get them away from it again."

Footman looked at his underling. "Don't be a cynic, Dan. I didn't need to mention that to make my point." He looked back at Perry. "But the same thing applies to our national government. The stock it takes over, it never relinquishes. The dividends from it, yes, but the Inalienable Basic issued to each citizen at birth reverts to the government on the death of the individual."

Leaving Perry with that, for a moment, he went over to the bar and replenished their drinks, though his had hardly been touched.

When he returned and had handed Perry Altshuler his fresh glass, he said, "Which brings us to the present, Perry. The present and the new changes that must be inaugerated if this, our beloved

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country, is to avoid catastrophy. The thing is, that politicians are not capable of managing industry. It's not their job. They don't have the training and aren't interested in acquiring it. They have to hire trained men to do it, and, too often, the men they hire are appointed not because of true ability but to pay off some debt the politician has run up, political or otherwise. Favoritism and nepotism are obviously rife. It doesn't wash, Perry."

Perry Altshuler had been following this fairly well. There wasn't too much of it that was brand new to him, but it was a subject in which he had never been particularly interested. From time to time he had heard of governmental scandals involving mismanagement of industry in which the government was concerned, but his way of life in the past hadn't been such that he felt involved. Let the damn politicians and bigwigs handle their own problems. All he had wanted was to be left alone to enjoy his dividends from his ten shares of Inalienable Basic. Of course, things were somewhat different now that he was acquiring additional stock in the nation's industry.

"No," the labor leader was going on earnestly, "the times call for some basic changes. Perry, tell me, who are the most competent to run the nation's industries?"

Perry looked at him blankly.

"The men who work in them," Footman said reasonably.

"In short, the I.A.U.U.," Dan Fellows said.

Perry blinked.

He said finally, "You mean you think the I.A.U.U. should take over the government?"

Damon Footman spread his hands as though in supplication. "What could make more sense?"

Something came to Perry Altshuler. He looked from one of the union men to the other. "Are you people Futurists?"

"Futurists!" Footman snapped. "Certainly not. They're a bunch of socialist-communists. They'd turn the whole country upside down. Anarchists."

Perry said, "Well, I guess it's about time for me to ask the big question. Where do I come in on all this? Why did you bother to send for me? You can't get much lower down on the totem pole than I am."

Damon Footman beamed at him. "In a great movement such as we project, Perry, we need key men. Especially in such fields as Communications, Statistics and the Economic Planning Board, in Greater Washington. Very well, we want you on our side. On tap. When something comes up when we need you, we'll let you know. 'Nuf said, Perry?" The union head turned to Dan Fellows. "Be sure that ten shares of Variable Basic are transferred to Perry's account before the day's out. There'll be more to come, if and when we call on him. The I.A.U.U. takes care of its own. We union men have to stick together."

When Perry Altshuler entered Jerry's Joynt that evening, he was still in a euphoric haze. He had just come from his mini-apartment and there he had done a trembling credit balance check on his teevee phone screen.

Besides the ten shares of Inalienable

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Basic which had been his all his life, there were fourteen shares of Variable Basic. Evidently, four of these were his year's advanced pay from his job as a Senior Supervisor in Central Statistics but the other ten could only be those promised him by Damon Footman.

Fourteen shares of Variable Basic. How much was it that Kurt had said he got for his lone share when he cashed it in? Over four thousand dollars. It took only a moment's mental arithmatic to figure that he, Perry Altshuler, had a minimum of fifty-six thousand dollars in his account. He had never even dreamed in such terms before.

He sank down at a small table and stared at the listing of drinks, unseeing.

A voice said, an edge of sneer there, "Oh, too good to sit with the old gang, eh?"

Perry looked over, blankly. Jack Simons was with Kurt and three others of the boys a few yards away.

In actuality, he knew he wasn't welcome. It hadn't taken more than a couple of weeks or so to find himself out of the circle of companions he had known the better part of his life. All of a sudden he had been excluded. It had been bad enough when he had been drafted and hadn't figured out a way to dodge it. But, besides that, he no longer had the time to participate in their activities.

The gang had built up a complicated way of life, involving stretching out their Inalienable Basic dividends to cover their needs. Besides the necessities of life, they were able to work in days at the beach, periods of fishing and sometimes even hunting in the national parks. Two or three belonged to a wrestling team, several of them to a backlot baseball club.

Now he was out of all this. The ultimate point had come when he made the mistake of dropping the information that he had been promoted to the position of a boss, that he was actually part of management. A minor part, perhaps, but among the ranks of the managerial class. They couldn't forgive him that.

Now he made a half wave of greeting, as though Jack Simons had been joking and went back to his perusal of the autotable's list of drinks. A lifetime of penury couldn't be denied. He dialed the fermented product of the oceans, popularly known as sea-booze but even as he did so, made a mental note that he didn't have to. With his added dividends he could begin taking a longer, more prosperous view.

He could move into a larger apartment, for instance. Perhaps one, even, that had a small escape room. He could begin eating food based on other ingredients than, say, Antarctic krill. He could start drinking such guzzle as tequila, still distilled down in what was formerly Mexico, from the maguey plant. The use of maguey for making pulque, mescal and tequila didn't violate the Economic Planning Board's ban on cereals for beverages.

A figure loomed at the side of his table and he looked up expecting to see one of his old friends, now possibly come over to make some snide crack.

But it was Marvin Brunner, the lanky Futurist who had left him the pamphlets the other night.

"Mind if I sit down?"

"No, of course not," Perry said,

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And, for the second time in his life, offered to buy a drink.

Brunner looked at him quizzically. "You must be feeling rich." It came to Perry Altshuler that he had no one at all, these days, with whom to discuss the developments of his life. The last few weeks had shattered his past beyond the point where it could be reassembled. He had not even Jack Simons for a friend any longer.

He said suddenly to Brunner, "Why should Damon Footman give me ten shares of Variable Basic out of I.A.U.U. funds?"

"Ten-shares-of-Variable-Basic!"

"That's right."

"What do you have to do for it?"

"Nothing. Dan Fellows came around this morning and said Footman wanted to see me. So I went."

Brunner said, scowling, "Fellows is one of Damon Footman's troubleshooters. Kind of a hatchetman. Don't let that amiable exterior throw you off. He can be bad medicine. I've wondered what he was doing with a lowly job like he's holding down now as a shop steward and organizer in Central Statistics. At any rate, what happened?"

Perry hesitated. Finally, he said, "Look, how much do you know about Damon Footman's program for . . . well . . ."

Marvin Brunner was looking at him strangely. "For overthrowing the present government and having the I.A.U.U. take over?"

Perry hesitated again, then he said, "Listen, what do socialism and communism mean?"

The other grinned. "They're two bad words. You should have your mouth washed out with soap."

"I thought communism was the kind of government they have over in Common Eur-Asia."

Brunner shook his head. "Not any more. Actually, they didn't have real communism before but they called it that and so did almost everybody else. Back in the days of the USSR what they really had was a sort of State Capitalism. Today, since the evolving of the Tito heresy which started in Yugoslavia, what they actually have is more nearly like syndicalism.

"But to get to this socialism and communism bit. Altshuler, certain words develop to a point where they gain an almost religious connotation. On one side you have terms like Mother, the Flag, Freedom, Democracy and so forth. Saying anything against any of these is simply to provoke a fight with ninety-nine out of a hundred. On the other side, you have terms such as socialism, communism, nationalism, propaganda, and, say, prejudice. Accuse a man of subscribing to any of these and you're apt to get slugged. He doesn't have to know what they really mean. He has *faith*. He knows he's against them without looking into their definitions. For example, do you consider yourself a prejudiced man?"

"Hell, no, of course not."

"Then you should be ashamed of your thinking processes. You're not using the mind mother nature gave you."

Perry looked at him, mildly indignant. "What are you talking about? I haven't any prejudices and I don't want any."

"Altshuler, prejudice means *pre-*

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judged. Suppose you go into a strange neighborhood and a bunch of kids mug you. Great. The next time you go into that neighborhood, some drunk drops a flowerpot on your head from a third story window, by accident. The next time you go into that neighborhood, you stumble over a pile of garbage that's been left out in the street and nearly break your neck. Hombre, let me tell you, if you ever go into that neighborhood again, and meet some people there, if you haven't some prejudice against them, you're simply silly. Prejudice means, pre-judged. What's the use having experiences if you don't profit by them?''

Perry said impatiently, ''What's this got to do with socialism and communism?''

''Like I said, they're bad words. Silly to use them. In the early days of the term socialism, a lot of people took to the general idea. They didn't have a very clear picture of what it meant, possibly, but they vaguely supported the idea. Fine. So a lot of opportunists jumped on the bandwagon. Hitler called himself a National Socialist. Mussolini, in his early days, was supposedly a socialist. Roosevelt's opponents branded him a socialist. The so-called communists of Russia, and the other soviet countries, called themselves socialists, though in actuality they were neither communist nor socialist. At any rate, with this sort of treatment, the terms became bad words.''

''Well, do you consider yourself a socialist or communist?''

Brunner shook his head ruefully. ''It's a living language, and those words have fallen into disrepute. I'm a revolutionist, perhaps, although that word too usually leaves a bad taste in the average mouth. Say revolution to the average person and he has immediate pictures of people running up and down the streets shooting each other, barricades being stormed, that sort of thing.''

Perry scowled at him. ''Well?''

The Futurist laughed wryly. ''By definition, a revolution isn't necessarily violent. Violence can accompany one but it isn't a requirement. It's something like childbirth which can be painful, but isn't necessarily so, and the pain is not the basic thing. The basic thing is a new child coming into the world.''

He thought about it. ''Take the wheel of history. Sometimes it turns. It makes a revolution. If there's anybody under it at the time, they might get hurt, but that's besides the point. The wheel can turn without anybody being under it. It behooves men of good will to make every effort to see nobody is under it when a turn is due to take place.''

''Well, this revolution of yours. You Futurists. What is it you want to do?''

''We feel the point has finally come when all the industry of the nation should be taken over by the people as a whole and democratically operated by and for them. Private ownership of the means of production, distribution, transportation and communication has become an anachronism.''

There was that word again.

But Perry said skeptically, ''Who'd run them?''

''Actually, the same people who do now. The managers, the engineers, the technicians, the scientists, the workers. But they'd be democratically elected, those who had managerial positions,

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instead of appointed as they are today by politicians in government managed industries or by owners in privately owned ones.''

Perry looked at him in surprise. ''That's what Damon Foorman wants!''

Brunner shook his head. ''No. What Footman wants is for Footman and his gang of I.A.U.U. officials and goons to take over. There would be some similarities, but the democratic principle would be missing. You'd have a dictatorship, with Footman's gang appointing the heads of industry, Footman and his gang skimming the cream off the top of the nation's production.''

Brunner twisted his long face dryly. ''When I used that example of the wheel of history and revolution, I should have pointed out that the wheel can turn both ways, backward as well as forward. When it rolls backward, we call it reaction. The I.A.U.U. is reactionary.''

Perry said truculently, ''I can't see much difference between his I.A.U.U. taking over or you Futurists. Once in power how do we know you wouldn't be just as bad as Footman's gang?''

Brunner twisted his long face again. ''The Futurists don't expect to take over, Altshuler, and wouldn't even if they could. The moment the majority of the people vote for Futurism, the organization disappears, its job done. I, for instance, couldn't run an industry even if I wanted to. I don't have the background and training. It's up to those who work in the industries to vote for who will run them. They're in a position to know better than anyone else.''

In the morning, James Terwilliger dropped by and handed Perry a plastic card. He said, ''Here's your new Universal Credit Card.''

Perry said, ''What's wrong with my old one?''

''Nothing. You have the same number and everything. It's just that now you're a Senior Supervisor and have a highier priority when it comes to securing classified material from the computer banks. The sort of work you're doing, you'll probably never need it, but routine is routine and now as a supervisor you hold this priority.''

''Well, thanks,'' Perry said, taking the card.

Terwilliger turned to leave, after casting a quick approving eye over the chattering machines and the women operating them.

Perry Altshuler said, ''Mr. Terwilliger.''

''Yes?''

''Do you belong to the I.A.U.U.?''

The Central Statistics department head grunted sourly. ''Practically everybody who works belongs to the I.A.U.U. Long since, they began recruiting management. The Universal Union today, Altshuler, is organized from top to bottom. Even the government wants it that way. Of course I belong. You should see the chunk of dues that comes out of *my* pay.''

After the other was gone, Perry Altshuler looked down at his new Uni-Credit Card for a long moment. There were a couple of new numbers on it that hadn't been on his old card. Evidently, to do with his new computer banks priority.

Absently, and for no particular reason, he put the card in his desk phone

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screen and requested a credit balance check and it came. The fourteen shares of Variable Basic were still there all right, all right. He hadn't been dreaming.

He thought about it for awhile and something that Damon Footman had said to him came back. "My boy, I've had you checked in every manner it's possible to check a man under the Ultra-welfare State. Every bit of information in the computer data banks, since before your birth, right on through. I probably know more about you than you do. . ."

Ten shares of Variable Basic the other had given him. A fortune. Why?

He dialed and said into his screen, "I want a complete report on Damon Footman, International Secretary of the Inter-American Universal Union."

A robot voice said, "Your Uni-Credit Card, please, to check your computer data bank priority."

He put the card in the screen slot and pressed his thumbprint in the appropriate place.

It took him an hour to scan the material. When he was through, he flicked the screen off and looked down at it blankly. Some of the information had been interesting, but it hadn't contained anything that seemed to make any great difference.

Ten shares of Variable Basic. An outright gift. Hell, an outright bribe. But why?

It came to him so suddenly, so obviously, that he wondered why it had taken him so ridiculously long.

He flicked on the desk screen again and said, "Give me the former Social Security number of Damon Footman." He put his card in the slot and his thumbprint on the screen.

A robot voice said, "127-03-1546."

He noted the number down, came to his feet and went back into the stock rooms. Mary Ann Sward was there, manually filing a handful of cards.

Perry said, "Put that off for the time being, Mary Ann and finish that run-off Mr. Terwilliger wanted for this afternoon. And let me have your sorting needle, will you?"

"Yes, Mr. Altshuler." She handed him the needle and left.

It took him several hours to find what he was looking for. They were, of course, among the Internal Revenue cards and they went back to the Asian War and the financial corruption that had prevailed so widely in those days in the dispensing of American money among the Asiatic allies and some of the civilian contractors. They involved reports on monies sent to numbered accounts in Switzerland, shockingly large amounts.

Perry Altshuler, staring down at the cards, wondered why the information had never been acted upon. What bumbling about in the Greater Washington bureaucracy—whether deliberate of otherwise—had allowed the endless work that had gone into obtaining this drastic material to go by the board? It was long years ago, of course, and the material could never be utilized in the courts. But the very fact that it existed was damning. No man's career could survive such a revelation. Certainly no public figure.

A voice from behind him said, "Ah, you've anticipated Mr. Footman, eh Perry? You know, he said you were stute. But I don't think he expected you

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to be this stute."

Perry Altshuler turned.

Dan Fellows had a small, wicked looking gun in his right hand and was jiggling it thoughtfully.

He said, "The big fellow has a standing order with the computer banks. If anyone checks him out, asks for information about him, he gets an immediate report. When it came through that you were checking him out, he sent me over. We have another little bit came through about you too. You see, we keep an eye on our boys. You've been seen in the company of a notorious Futurist."

Perry looked at him emptily.

Dan Fellows grinned suddenly and put the gun away under his jacket, under his left armpit. "I don't think I'll need that," he said. "Besides, it'd be a little noisy in here and there're too many workers out front that saw me come in. And, anyway, you're one of us, aren't you Perry?"

"I don't know if I am or not," Perry said.

The union organizer grunted amused deprecation. "Perry, Perry," he said. "The boss just sent me over with a little job for you to do. He appreciates you being able to do a little job for the union from time to time, Perry, and he told me to deposit another five shares of Variable to your account. Now, what Mr. Footman wants, Perry, are a few punched cards that seem to be in the files here. Or, at least, used to be. Now they would probably be right there in your hands, if I am reading you right. In the past, we didn't know how to go about locating them."

Perry looked at him emptily.

Dan Fellow shook his head and grinned. He said, ever so softly, "Perry, in the next few moments you're going to have to decide if you're a good I.A.U.U. union man, a supporter of the status quo, or a god-damned Futurist."

Perry said slowly, "Are you sure that those are the only alternatives?"

The smile of Dan Fellows was very cold now. He brought his vicious looking little gun out again from its shoulder rig and put it in his side pocket still in his hand.

He said, "Like I said, it'd be too noisy in here to have any rough stuff, but we could march on out to some more suitable locale for some serious persuasion."

"You don't understand," Perry told him, handing over the cards. "You said there were two alternatives, either joining the I.A.U.U. or the Futurist union. Suppose that I didn't want to join either and would like to ask another small favor of Mr. Footman besides the extra five shares of Variable."

Jerry's Joynt was ever the same. The same large screen Tri-Vision set at one end for live shows. The same large screen connected with the library computer banks at the other end so that the customers could dial any movie, any show or musical piece in the files, and these days everything filmed or recorded automatically went into the data banks. The auto-tables, with their menus and lists of drinks set into the surface and their screens and dials so that the habitues could make their selections without waiter or cashier involved.

Jerry's Joynt was ever the same and so were its regulars—Jack Simons, Kurt and all the rest of the gang.

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They didn't bother to look up when Perry Altshuler entered, and so it was they missed his swaggering approach. Jack Simons snorted disgust when Perry drew up a chair and sat down with them.

Ostentatiously, the newcomer brought his Uni-Credit Card from his pocket and stuck it in the screen. He said, "I want to sell at current market, one share of Variable Basic."

A robot voice said, "Completed. Four thousand, three hundred and twenty-two dollars and sixteen cents have been placed to your credit balance."

Eyebrows had gone on high.

Perry Altshuler said grandly, "Celebration, boys. Order up. Pseudo-whiskey for all, or whatever else you might want."

Kurt said, in awe, "Celebration of what? You get another promotion?"

Perry took his time dialing the drinks, before he answered. "Promotion is right. Promoted back into the ranks of the unemployed, chum-pals."

"You mean you got fired?" somebody blurted.

"How'd you swing it, Perry?"

Jack Simons said, "Oh, hombre, you said you weren't going to stand for it, Perry, and you didn't."

Perry said modestly, "They couldn't make a working slob out of me. And what's more, I got out of the whole thing with a lot of Variable Basic."

"How'd you do it?" Kurt said. "Holy jumping Zoroaster, I thought they had you hooked. For a while there, I even thought you were beginning to like it."

"Not me, chum-pal. They couldn't make a slob out of me. It was nothing. I just went in to old man Terwilliger,

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he was my boss, and told him he could take his job and get spayed."

They bug-eyed him in disbelief.

He said, off-handedly, "I got some good connections. Damon Footman happens to be an acquaintance and he's got *plenty* of pull. When I let him know I wanted out, he put the old pressure to bear after I did him a favor."

"Holy smog, that's telling them," Simons said. "You're no cloddy. How about another round?"

There was another round and another and still another. At this time, before the new dividends from their Inalienable Basic came in, the gang was seldom able to get lushed up, certainly not on anything superior to sea-booze. The party grew. Other acquaintances and even strangers drifted in and joined it.

Eventually, Perry Altshuler found himself face to face with Marvin Brunner, who was eyeing him strangely. He said, "I was looking for you, Perry. What's going on around here?"

Perry grinned at him slackly and slurred, "Big party. What'd you want with me, Brunner?"

"Well, I was wondering if you'd read those pamphlets and what you thought of them."

"I read part of one of them," Perry said thickly, "and found something that suited me to a tee, hombre. To a tee."

The lanky man frowned. "What was that?"

"Come from the Declaration of Independence and it says something like . . . mankind is disposed to suffer . . . than to right themselves by abolishing the forces, uh, I mean, the forms they're used to. And that's the way I feel, Brunner. I'll just continue along with the way things are, chumpal. If it was good enough for my old man, it's good enough for me. You won't hear me saying anything against the government. I could get by with my Inalienable Basic alone, if I had to, but now I've even got some Variable. Why should things change?

"Holy smog, if you Futurists ever got in, you'd have everybody working, like a bunch of slobs."■

In Times To Come

January's cover, by Rick Sternbach, illustrates not a story, but a highly thought-provoking speculative fact article. In 1966, J. E. Enever made quite a splash in these pages with "Giant Meteor Impact," an article (which also got the cover!) exploring the possible consequences of a very large meteor hitting one of Earth's oceans. Now he's back with a similarly analytical look at a related question: was an even larger meteor impact responsible for certain odd features recently discovered on Mercury? Among other things, there is reason to suspect that a sizable chunk of the planet is just plain missing, and Enever's thinking about why eventually led him back to updating some of the ideas in his earlier article.

Our feature novelette, "Emergence," introduces a new writer, David R. Palmer, from whom I hope to see more. He's attempted some difficult things in this and pulled them off rather strikingly, not the least of which is taking two classic themes and welding them into something fresh and new: would you believe an after-the-holocaust story that makes you feel good? And the heroine is one of the more unforgettable characters I've met recently, on or off the printed page. . . .

And then there are Part II of Shuttle Down *and a variety of other stories and features—including, I hope, our first Annual Index, which quite a few readers have suggested that we publish.*

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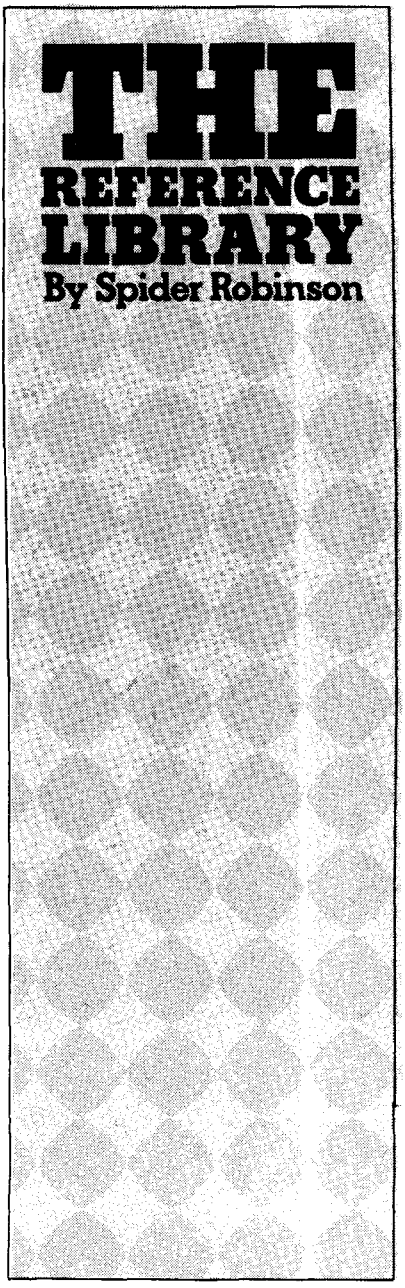

Andre Norton Series, Gregg Press, $9.95 each (15% higher outside U.S.)
E.E. Smith Skylark Series, Berkley, $1.95 each
A Feast Unknown, Phillip José Farmer, Playboy Press, pages & price unknown
Lord of the Trees/The Mad Goblin, Philip José Farmer, Ace, 374 pp., $2.50
The Exiles Trilogy, Ben Bova, Berkley, 441 pp., $2.50
Born To Exile, Phyllis Eisenstein, Dell, 254 pp., $1.95
Murphy's Law, Arthur Bloch, Price/Stern/Sloan, 94 pp., $2.50 ($2.95 in Canada)
West of Honor, Jerry Pournelle, Pocket, 190 pp., $2.25
The Mercenary, Jerry Pournelle, Pocket, 223 pp., $1.95
Heroics, George Alec Effinger, Doubleday, pages & price unknown
The Magic Labyrinth, Phillip José Farmer, Berkley/Putnam, 339 pp., $11.95
City of Baraboo, Barry Longyear, Berkley/Putnam, 240 pp., $10.95
Dragon's Egg, Robert L. Forward, Del Rey, 346 pp., $9.95
New Tales of the Arabian Nights, Richard Corben & Jan Strnad, Simon & Schuster, lotsa pages, $7.95
Star Fall, David Bischoff, Berkley, 233 pp., $1.95
The Decline And Fall of Practically Everybody, Will Cuppy, Dell, 223 pp., price unknown

It hasn't helped to switch from reviewing monthly (as I used to do in *Galaxy)* to quarterly (as I now do here). When Doc Schmidt calls up to remind me that the column is due next week, I could swear, every time, that it's been no more than a week of two since I wrote the last one.

But each time I repress the urge to panic, and rummage around the house—and sure enough I find a dozen or so books I have read but not reviewed yet. Stan is right, it *has* indeed been 3 months since the last column; time to hammer out another one.

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Only this time, dammit, it really *has* been only a couple of weeks since I wrote the last one!

It's the sale of Analog to Davis Publications that has done me in. Davis apparently had a longer lag between receipt-of-copy and publication than Condé Nast did, which leaves me with a large hole to fill—and 2 or 3 books with which to fill it. With deadline a mere week away, there is clearly only one thing to do.

Stall.

Fortunately to God there are a number of books sticking out of the unsightly heap which I can recommend to you without so much as cracking the cover first—reissues I remember with great fondness, and welcome back to the land of the living. I will ramble on about these for a while, and while I am doing so I will be hastily reading at least some of the books with which I had intended to fill this column: hopefully I will finish at least a few of them before deadline intervenes. (Of course this requires me to read and write simultaneously—if I tried it on a time-sharing basis I'd end up with the mental equivalent of Tennis Spectator's Neck—but fortunately ever since my college days my mind has run in stereo.)

So:

From fan mail and con-con (convention conversation) I estimate that about thirty percent of all SF readers got started on Andre Norton. She may well be SF's most prolific novelist: I have no complete bibliography for her, but adding together a few partial listings I do have, I'd guess she has written at least a hundred SF or fantasy novels.

All right, suppose you just got off the starship: what can I tell you about Andre Norton in a few sentences? Well . . . I cannot say she has ever, to my knowledge, broken new ground: her best, and her worst, ideas all seem to have been borrowed from the SF Community Property Grab Bag (and, I must admit, all returned in excellent condition). But her craftsmanship is absolutely unsurpassed; she has the knack of making structure so seamless with the story itself that the structure disappears from view. She keeps you turning pages. She has often been stereotyped as a writer of juveniles, and indeed I can't recall anything of hers I've read that I would hesitate to lend to my friend John's ten-year-old. But if Tasha left it lying around, John would probably steal it and read it himself.

In fact, my only major objection to Norton's books has been that they are books. That is, highly perishable artifacts, which tend to crumble after a mere three of four readings. This has been remedied—by Gregg Press, of course. Gregg's SF Series exists to see that quality SF does not rot away because of the cheapness of its original publishers—whenever series editors Dave Hartwell and L.W. Curry remember another book that they want to *make sure* their grandchildren will get to read, they publish it in an indestructible hardbound edition, on acid-free paper, and then sell it at a price more than competitive with standard contemporary "hardcovers."

They already have 17 Norton titles in print (write to Gregg Press, 70 Lincoln Street, Boston MA 02111 for their splendid catalog), and now here are four more.

Catseye (1961) is one of Norton's best, about a young man who gets a job in an interplanetary pet-shop and discovers that he is telepathic with the animals. He and they become entangled in a plot with more twists than forty feet of telephone cable, involving revolution, murder and intrigue. Few writers

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handle telepathy better than Norton.

The second book was originally called *Star Man's Son;* the 1953 Ace paperback version was retitled *Daybreak—2250 A.D.* In an effort to make even more trouble for librarians and catalogists, Gregg has chosen to call it *Star Man's Son 2250 A.D.* this time around. By any other name, it is a classic After-The-Collapse Story, set 200 years after atomic Armageddon. The hero is a typical Norton protagonist: young, ambitious, and "different," possessed of a wild talent for which he is persecuted—in this case he has silver hair and extra-keen hearing and night sight. The story is engrossing and satisfying.

The last two books are related. *Storm Over Warlock* introduces the planet Warlock and its matriarchal society, governed by means of a kind of mind-control, and also introduces Shann Lantee, a slum-kid who survives alien massacre and endless adventure to become a cadet in the elite Terran Scouts. The sequel, *Ordeal in Otherwhere,* is a genuine SF rarity: the heroine, Charis, is a slave-girl—and there isn't a breath of sex in the book, kinky or otherwise. Her destiny and that of Lantee, now an officer, have intertwined by page 78, and before long the fate of Warlock hangs in the balance, and like that. I don't know if there are any other books set on Warlock, but there's enough color and background in these two to fill a dozen average SF novels.

All four books come in silver dust jackets, with black-and-silver illustrations by Fred Knecht, Jr., who is not bad and who reminds me just a hair too much of Jim Steranko. Each sells for $9.95, and single copies should be ordered from F&SF Book Co., Box 415, Staten Island NY 10302, rather than from Gregg. But you might send Gregg a get-well letter they can pass on to Andre Norton, who, I am told, is in very poor health lately.

Another series I can recommend sight unseen:

Those few of you who have somehow not yet read Doc Smith's "Skylark" series are directed to Berkley's simultaneous reissue of all four books. Smith has come in for so much abuse the last few decades (most often from people who have themselves written nothing that anyone wants to read) that I would spend a couple of pages defending him here, if Robert Heinlein had not already done a definitive job of it in his new book, *Expanded Universe*. The Skylark series begins with Dr. Dick Seaton's discovery of total matter/energy conversion, and accelerates sharply from there, as Seaton battles Smith's greatest villain, Blackie DuQuesne, across the macrocosmic universe. The series broke with the conventions of its day by a) combining the Dashing Hero and the Genius Scientist into a single character, and b) giving the villain traces of humanity and even nobility.

Sure, it's all corny as hell—what's wrong with that? *Star Wars* was maybe cerebral? Even John Dykstra's genius and umpty thousand dollars could not smash a planet as elegantly and impressively as Doc Smith used to do it, using only paper and ink.

You already know Lord Grandrith. You may not know him by his given name, James Cloamby, or by the name given him by The Folk, *tls*. But you almost *have* to be familiar with the "romanticized biographies" of him written by Edgar Rice Burroughs, or at least the movies starring Johnny Weismuller, Elmo Lincoln, Gordon Scott, et al., inspired by those books. He wears a loin cloth and has killed lions with a knife—does that help?

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Similarly, you probably know about Doc Caliban—again, by another name. Hint: his skin is bronze all over, and he is not suntanned. His exploits have been fictionalized by a number of men who were all named Kenneth Robeson (chiefly Lester Dent).

But the exploits of these two have been so romanticized and bowdlerized by their semibiographers that it becomes almost impossible to sustain belief in their existence much past adolescence. You've probably decided they're imaginary. Fortunately both men have written their memoirs, and the noted writer and hoaxter L. Qeequeg Tincrowdor (who here employs his favorite pen name, "Philip José Farmer") has somehow obtained 3 volumes thereof, two by Grandrith and one by Caliban.[1] At last the record is set . . . well, "straight" is not exactly correct.

The first book, **A Feast Unknown,** was originally published by a now-defunct "quality porn" house in 1969; even in these enlightened times I believe it may succeed in shocking you. The closest it comes to "normal" sex is an early scene in which the Jungle Lord is buggered by a Middle-Eastern captor, and by the end of the book we're into clitoridectomy and testephagia and things that don't even have *Latin* names. Grandrith and Caliban, you see, have both been given an Immortality elixir, and one of its more outre side-effects is . . . no, this is a family magazine. Go read the book.

The second two memoirs, **Lord of the Trees** by Grandrith and **The Mad Goblin** by Caliban, are published in a single volume by Ace, and in contrast to *Feast* they are squeaky-clean—but just as violent. They continue the Dynamic Duo's heroic battle with their former masters, The Nine. Perhaps the most chilling group of villains in the history of literature, The Nine are incredibly ancient and powerful immortals, who have secretly ruled mankind for over thirty thousand years. They are so scary that you are relieved to have met only a handful of them by the time the second book closes. Grandrith and Caliban both served The Nine for decades, in exchange for immortality, and were both among 500 "candidates"—a pool of potential replacements maintained in case one of The Nine should be killed. But when they discovered, at the end of *A Feast Unknown,* that The Nine had been manipulating them and their loved ones in intolerable ways, the Ape Man and the Man of Bronze went free-lance together. In the two Ace memoirs, they each tell the story of their subsequent two-pronged attack on The Nine: non-stop slambang action careens through more than 300 pages, using up enough ordnance and troops for a respectable war, and culminates in a massive nighttime firefight at Stonehenge.

Be warned: both Grandrith and Caliban's accounts end in the same place: midair. This is not fiction, remember? This is *fact,* and Leo—pardon me, Phil—has not seen fit to release additional installments yet; you'll just have to wait to find out how things came out.

Other reissues you can't go wrong with:

—Ben Bova's **Exiles Trilogy,** here available for the first time in a single volume. The hardcovers *(Exiled From Earth, Flight of Exiles,* and *End of Exile)* originally appeared from '71-'75, and I enjoyed them all. Genetic engineers produce a brilliant new breakthrough which threatens the World Gummint; they are exiled from Earth, manage to convert their orbiting Cov-

[1]Caliban's, with his characteristic pathological modesty, is told third-person.

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entry into a starship and set sail for the ass-end of the Galaxy. Only a writer like Ben (who knows how science and politics really work) could have turned this gosh-wow synopsis into a plausible and compelling story, told with skill and polish, and populated with convincing and likable characters.

—Phyllis Eisenstein's **Born To Exile,** a collection of 5 fantasy novelettes and novellas about Alaric the Minstrel, which reads more like a real novel than such fix-ups usually do. I enjoyed the stories in *F & SF,* where they appeared from '71-'74; I enjoyed and favorably reviewed this collection in its '78 Arkham House hardcover edition; here it is for those who can't afford hardcovers. I don't generally care for witches and wizards and minstrels and princesses a whole lot—but this is written with unusual sensitivity and intelligence. The people are the story, and I believed the people.

—Murphy's Law, and other reasons why things go wrong, by Arthur Bloch, in its 7th or 8th reprinting by now. In 92 pages, Bloch collects hundreds of Laws, Principles, Observations and Postulates, nearly all of which are restatements, refinements or corollaries of Murphy's Law, as applied to different disciplines. There are more than a dozen subheadings, and at times it all gets a bit repetitious, but gems stand out. My two favorites are "Canada Bill Jones's Motto (Supplementary): A Smith and Wesson beats four aces," and of course, "Cole's Law: Thinly sliced cabbage." Bloch's scholarship is not impeccable; he has several Robert Heinlein quotes mistakenly attributed to other people, for instance. But he does quote Sturgeon's Law and Clarke's Three Laws accurately.

Don't try to read this in a single sitting: the 100th funny restatement of "you're screwed" has stopped being funny. But it's a cynic's delight to dip into occasionally. If your bookstore doesn't stock it, write to Price/Stern/Sloan, 410 La Cienega Blvd, LA, CA 90048 and add 50¢ for postage and handling.

—Jerry Pournelle's books about John Christian Falkenberg, **The Mercenary** and its prequel, **West of Honor.** These need no introduction to any Analog reader who goes back to '71; portions of the former book were published here from '71-'73, and had a lot to do with Jerry becoming the first-ever recipient of the John W. Campbell Award for Best New Writer in '73. If you remember the stories but don't own the book, try it: I've seldom seen a better job of turning related stories into a true novel. (Or perhaps the stories were just planned that way; it's been a long time since I read them.) *West of Honor* is a novel that always was a novel, and fills in some of the 27-year gap between Prologue and Chapter One of *The Mercenary,* taking Falkenberg from Captain to Major. It is told first person by Lt. Hal Slater.

These books are excellent, well-told science fiction stories that, in the course of entertaining, implicitly argue (strongly) for some of Jerry's own opinions; a few people who are pathologically afraid of those opinions have therefore criticized them as "mere propaganda." If you are knee-jerk turned off by words like "honor," "courage," "liberty," or "duty," you might want to skip these books—but I wish you wouldn't.

Now I'm ready to talk about some new, original books. And not a moment too soon: I'm out of reissues.

George Alec Effinger's writing is transcendently difficult to describe. If I had to pick a single word it would be

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"idiosyncratic." If you crossed R.A. Lafferty with a Zen monk, you might prouduce something very like Effinger. Or you could try crossing Tom Robbins with . . . no, this won't work. The only way you're going to know if Effinger's unique brand of surrealist fantasy is to your taste is to try some.

He was a star graduate of the '70 Clarion Workshop, and his first novel, *What Entropy Means To Me,* was a Nebula finalist. He is one of the best-loved people in the SF community, and he has seen too many hospitals for a man his age. He wrote to Analog and said, in effect, "If you're going to review one of my books, let it be *Heroics.*"[2] So I read it, and now I'm sitting here scratching my head and wondering how the hell to tell you about it.

Perhaps if I attempt a plot summary you'll see what I mean. Our heroic protagonist is an 82-year old woman named Irene—although at various times she will be transformed into an old man, a young man, a young girl, and a 65-year-old composite of Lewis & Clark. How? And why? Don't ask. Anyway, she lives in a future in which all the problems of man have been solved, except boredom—wherefore everyone collects things. Irene collects 20th century Depression glass. Unhappy at home, she resolves to walk from what was once Louisville, Kentucky to what was once Springfield, California, to look for what—if it still exists—must be the largest surviving collection of Depression glass in the world. She confidently expects to die trying—but her first day on the road she is accosted by Glorian, a professional Vergil of no great competence, who has been assigned by the Powers That Be to guide her on a heroic quest for an unnamed Grail—whether Irene likes it or not. Before long she is fighting in the 10th century Battle of Maldon. But when things *really* get weird is when she reaches the Great Teflon Plain, which stretches unbroken from the Mississippi to the Rockies . . .

No, this isn't working either. It makes Effinger sound like Sheckley, and he is not, especially. He's quieter, more underplayed. Sheckley, no matter how lunatic his plots, pays very careful attention to structure; Effinger seems to find structure irrelevant (*or* fashions structures too subtle for me to discern—which for my purposes amounts to the same thing, don't it?). Sheck's plots usually have at least dream-logic; Effinger's seem to have none at all. Not because he fails in the attempt, but because he seems to *choose* not to *make* the attempt. Yet he holds my attention, and frequently delights me.

What I think he does is put his subconscious in control of his typing fingers, and lets it pour subconscious symbols and imagery right onto the paper, allowing his cerebrum an occasional pokerfaced comment. How much you enjoy this, therefore, would seem to depend on how closely your subconscious matches his—and frankly I would have to say the odds are not good, in my opinion. One of the funniest chapters in the book, for instance, will fall flat if you never played the board-game *Clue* as a child.

Part of the problem here is Lester Del Rey's oft-quoted dictum, "When anything can happen, who the hell cares

[2]Note to writers: I strongly approve of this practice. If there's a book you're particularly proud of, for Pete's sake let me know. With over 400 writers competing for 60 review slots a year, I'm liable to review about 1 in 7 of your books. Murphy's Law says I'll pick the one you wrote in 2 weeks to pay for Mom's operation. I *do not* promise to review the one you recommend, but I'll try.

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what does? '' Well, it depends on how much you enjoy touring the inside of George Alec Effinger's most unique head, a completely subjective matter. I enjoyed *Heroics* immensely, but then I am a well-known connoisseur of eccentrics.

Why don't you try *Heroics* and see?

I have not been following the Riverworld series. I hate continued stories of any kind, and I can imagine nothing more frustrating and intrinsically self-defeating than trying to enjoy a continued story whose installments come along once every couple of years. I resolved to wait until the series was complete, and then assault it frontally, from start to finish.

So **The Magic Labyrinth** just arrived, the concluding chapter in the mainstream saga (although there are two more sidestream books coming), and I took the plunge. And came away disappointed.

P.G. Wodehouse was the undisputed master of the deliberately, intensively recomplicated plot: just as you were *totally* confused and all seemed in perfect chaos, he would tug gently on his Magic String in the last chapter and everything would fall into place at once, the hidden pattern of the tapestry revealed, dozens of interlocking dilemmas resolved happily in a single stroke. He invariably did this in single, rather short books. For my money there is no other way to do it: if the plot recomplicates for more than about two hundred pages, I tend to say the hell with it and skip ahead to the ending. There is an optimum size for any puzzle. This is why I gave up on Zelazny's *Nine Princes In Amber* series: complicatory overkill.

What I think happened here is a case of the setting metastasizing until it takes over the whole work. As I reconstruct it, Phil started out with about enough plot to fill a single pretty-good-but-not-great novel. But Jesus, the setting! A multimillion mile river, circling an entire planet! Jesus, the cast! Every human being who has ever lived, *plus* a race of gods! How could you possibly *avoid* an immensely complicated story, with that many powerful individuals influencing events? Especially since even killing them off does not take them out of the story? Phil happens to be very well read in history, anthropology and biography—before he knew it he had a saga on his hands, and who could blame him? *The idea is too damned big.* No writer that ever lived could manipulate forces that large satisfactorily; it's like an artist trying to paint a mural on the face of the moon. The central story, Richard Burton's quest to reach the head of the River and find out What The Hell Is Going On Here, is drowned in an immense floodtide of essentially pointless anecdotes, about dozens of people who (with the single exception of Göring) live endless sequential lifetimes without seeming to learn or accomplish anything of significance.

Then there's the redundancy factor. In designing a step-rocket, you reach a point of diminishing returns. In Book I Phil sets 100 plates spinning atop broomsticks. In Book II he must give his attention to each of these, bearing in mind that many readers will have missed the first volume, while adding 50 new plates. By Book III he barely has time to introduce 25 more, and by Book IV some of the older plates have grooves on their bottoms.

But the worst part is at the end. The author's foreword to *The Magic Labyrinth* specifically promises: ''Now ends the Riverworld Series, all loose ends tied together into a sword-resisting Gordian knot, all the human mysteries revealed . . .'' I am not about to give

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away the ending that thousands and thousands of people have waited nine years to read—but I must say that in my opinion when Phil tugs on *his* Magic String, about half of the loose ends get tangled into an impenetrable snarl, from which sprout at least an equal number of new loose ends—with a last sentence that hints that everything we have learned may be wrong. The promised explanation/resolution turns out to be a lot of flashy sleight of hand that boils down to, "There are some things beyond man's comprehension."

I have spoken entirely negatively so far. But like anyone who feels bamboozled, I must admit that the deed was done with my full knowledge and consent. I could have stopped reading at any time, and chose not to. Individual pieces of the mammoth mosaic were often delightful, and many of the inner, subordinate patterns they formed were immensely fascinating. David Pringle, discussing another Farmer novel in *The Science Fiction Encyclopedia*, says that it "contains some extraordinary images and grotesque ideas which suffer from a lack of resolution but nevertheless resonate in the mind." This very perceptive remark could well be applied to most of the Farmer I've read; perhaps I should have remembered that going in.

I will never forget the Riverworld. It did indeed invoke, and sustain for an unreasonably long time, the sense of wonder. I think Phil set himself a challenge so ambitious that a less courageous—or more prudent—man might never have attempted it; since he is a very good writer, the failure is magnificent. If you just relax and cut loose of the idea that it's all going to come together in the end, perhaps you'll have a better time than I did.

Barry Longyear's first published story, "The Tryouts" (*Isaac Asimov's SF Magazine*, Nov/Dec '78), was such a brilliant debut that I did something I've only done twice before: sat down and wrote a fan letter. I thought a talent that large needed encouraging. Shows you what *I* know: encouraging Barry to write turns out to be as necessary as encouraging kudzu to grow. Since that most promising debut, he has appeared in *IASFM* enough to qualify for the masthead (3-4 times in a single issue, under various pseudonyms)—he is as prolific as Orson Scott Card.

Like Card, he sometimes decorates his stories with SF gadgetry and hardware whose workings he does not appear to truly understand: Card, for instance, seems to have cold sleep confused with immortality; similarly, Barry's starships fail to convince and there are far too many inhabited terrestrial type worlds too close together. But—Barry seems to lack Card's penchant for reinventing the wheel, and where Card is usually *heavy*, Barry cracks a lot of jokes. (Though not exclusively: a serious story, "Enemy Mine," just won him a Nebula—his second year in the business!).

City of Baraboo, Barry's new Berkley hardcover, is a collection of six novelettes about the first interplanetary circus, O'Hara's Greater Shows. The obligatory attempt to disguise this as a novel, so as to *sell* it (all editors are neurotically prejudiced against story-collections, just because hardly anyone *buys* them) has seldom been done more perfunctorily, and there are a few small black holes in the plot that drain belief off into some other continuum from time to time. Furthermore, since this whole story-cycle turns out to be only a prequel to a much larger body of work (the Circus World cycle, concerning the *descendants* of O'Hara's people), there

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isn't so much an ending as a stopping—just as things are getting intriguing.

But forget all that stuff; none of that matters; go out and buy the book at once. You may never read a better book about the circus. About The Circus, as an institution and a profession and a family and a way of life. If you don't know why everybody comes out for a clem, or why the juice joint uses floaters, or why they send a First-of-May out for a pole-stretcher, or why no one *ever* hollers copper, even on a dip, come to Barry Longyear, a lifelong circus-lover, and let him educate you: you'll enjoy it. If you ask a circus man why he's in that crazy, chancey, arduous business, he will shrug and say only, "It's a disease." That sounds unresponsive, but it's not. It's the only answer possible, short of a whole book. A book like *The City of Baraboo*, which can describe and evoke that disease, through the eyes of love, and thereby infect you with it. This may not sound terribly science-fictional, but I think it is. What Barry has done here is to take a magnificent way of life, which today seems on the verge of extinction, and fling it bodily into the future, toward immortality. I have the sad feeling that books like this (and there are too few) may be the only kind of immortality the circus will have in the end.

But perhaps they will be—nearly—enough.

All right, hard-core hard-science freaks, relax: I've got one for you too. Boy, have I got one for you, one of the best hard-science SF novels I've ever read. It came covered with outrageous hype, by the likes of Clarke, Dyson, Clement, Sheffield and others. Specimen blurb: "I couldn't have written it; it required too much *real* physics."—Larry Niven. Furthermore, although I had never happened to read any of his fiction, I had immense respect for the maverick and supple brain of the book's author. Dr. Robert L. Forward is a pioneer in the field of gravitational astronomy, who has written science fiction and science fact for this magazine and *Galaxy* and *Omni* in his spare time; I gather that he sleeps for a full 8 hours, every other Leap Year.

With all this going for it, the book just *had* to be a dog, right?

Wrong. **Dragon's Egg** is a knockout. It is the next quantum level beyond Hal Clement's *Mission of Gravity* (as Hal himself graciously acknowledges in his cover-blurb).

It concerns intelligent life on the surface of a neutron star.

Yep, that's what I said. Upon the glowing surface of a 20-kilometer-diameter neutron star, under a surface gravity of 67 billion gees, a temperature of 8200 degrees, and a trillion-gauss magnetic field whose poles lie near the equator of spin, evolved the cheela, possibly the damndest life forms in all of science fiction—and this is the story of that evolution.

And of the extraordinary intercourse which takes place between the cheela and the human race. By elegant gravitational legerdemain, Forward places a human study team in a synchronous orbit 406 km from the surface of the neutron star! But it is the hell of a long jump even from there to mutual recognition, since the cheela average ½ cm in diameter (surely it is obvious that diameter is the appropriate measurement—that the cheela resemble chewing gum run over by a semi?), are quite primitive technologically (again, obviously), and have life spans on the order of fifteen normal-universe minutes. The story of how such an unlikely event as human/cheela communication man-

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ages to come about is absorbing, exciting and masterfully worked out; the only small problem is that the *results* of that communication will surprise no one who has read Sturgeon's "Microcosmic God" (a small group).

The book has some of the characterization-deficiency typical of the really good hard-science novel (where there often is no *room* for such things)—but only some. None of the human characters ever come alive for a moment—but some of the cheela are very memorable characters.

Of course, from time to time I felt that these cheela were entirely *too* easy to empathize with, that their emotional and psychological makeup was just too much like ours to be plausible, given their wildly different biology and environment. But then, if Forward had *not* thus "stacked the deck," it would not have been possible to write this story, so let it pass. I have other minor quibbles, and to hell with them, too. This book will almost certainly be on the 1981 Hugo list—and from what I've seen so far (this is written in June 1980) it may well be the one to beat.

One for the comic-fantasy fans, so flawless it will take no great long time to tell you about it. I have no complaint whatsoever with any aspect or particular of **New Tales of the Arabian Nights** by Richard Corben and Jan Strnad, and in fact I am pleased more than somewhat. Corben is one of the most original and talented comic-fantasy artists alive, whose work I have shamelessly adored for years; Strnad is a clever and inventive writer whose work until now (in underground comics) I have never cared for; together they have produced a masterpiece. When I tell you that an overgrown comic book[3] about Sinbad the Sailor is worth eight bucks cash, I'm *saying* something, Jack. Richard Burton would have loved this book. If you can't get it locally, write to Simon & Schuster—or McClelland & Stewart in Canada—and beef.

[3]8½ by 11, excellent paper, printing and production.

David Bischoff was just elected Vice-President of the Science Fiction Writers of America; it says here he has published 8 novels and 3 dozen short stories; he was a Nebula finalist in 1977. I just met his face at a convention last month; a quick hello and then the currents whirled us apart; he seemed like a most pleasant fella so when I got home I dug his latest, **Star Fall,** from the heap and dove in. And almost broke my nose. Do you remember what I said tends to happen when I select the one-book-in-8 of yours at random?

Let the text speak for itself. We open on an interstellar secret agent and assassin, standing alone on the roof of a 1.37-mile-high apartment building called the "Skyshafter." All italics and footnotes are mine:

> The wind was *fierce at this height. Thirty, maybe thirty-five kph,*[4] the man estimated. Airy fingers *slapped him, buffeted his face*[5] with *cold deadness like gusts from the open sky.*[6] Steadily *it*[7] flapped the *satin*

[4]If you don't have a conversion table any handier than Bischoff or his copy editor did, that's a fierce 18 mph breeze.

[5]Redundant, no?

[6]Leaving aside the question of whether there is such a thing as hot deadness, or indeed whether you can slap someone with any kind of deadness, it is this last clause which strips any vestige of meaning from the sentence. If the "airy fingers" are "*like* gusts from the open sky," and not in fact gusts, whose fingers *are* they?

[7]The antecedent for this pronoun will be found a full 3 sentences earlier.

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tails of his black evening jacket, waved the *ruffles of his French Lemurian cuffs and collar*[8] . . . . . Any stronger, the man mused, and the wind would simply sweep me away.

This fellow is looking down on a city "like a bundle of bizarre toy building blocks carelessly dumped on the planet's face . . . sprawled in random clumps and clusters . . ." which turns out in the next sentence to have "geometrically plotted rivers of streets." We are told that the man stood "beside" an unfenced edge; 3 paragraphs later we hear that he "paced forward, away from the edge," and that "He fell." A full page later we learn that in fact he stood *before* the edge, stepped *over* it, and fell *off* (not onto) the roof. He did this in order to reach the 69th floor unobserved. Bischoff supplies precise times, to 2 decimal places, for the fall and for the "suspensor-grav" deceleration, which suggest that those first 69 floors, at least, average about 65 feet high—but he never does explain why a man with controlled antigravity troubled to go all the way to the roof and then free-fall 2 kilometers in an allegedly strong wind to reach a near-ground destination. The assassin finds the window blocked with a "force-bubble," specifically described as a "sphere"—but when, with the aid of a Magic Gobbledegook Machine, he penetrates to the interior of the sphere, he is now somehow *past* it—it has no *other side*.

[8]Now, that's the way an ace commando dresses for a raid. Disguise? Hell, no: he also wears a "control belt" studded with dials and knobs and a "redly glowing vernia," and carries several large weapons and a variety of burglar's hardware that must have put bulges in even the finest tailoring.

Enough. This is all within the first few pages: from there it is a How Many Howlers Can You Spot? contest which numbs by overkill. His grammar and syntax are dreadful; he misuses common, basic words; and the new words he coins are clumsy—a full page after he mentions a "hydromat," he remembers to tell us that this artifact is a *bed*.

And if you can wade through the slaughter of the English language, the story is nonsense. It is subtitled, "A Space Fantasy," indicating that it seeks to be judged only by the undemanding standards of *Star Wars:* on those terms it is poor.

I cannot account for this book's publication, and yet here it is before me. Bischoff *has* to be a better writer than this, to have accomplished what he has. Something must have gone dreadfully wrong. But *what?* I'll have to try another one.

How can an SF book reviewer justify ending his column with a 30-year-old collection of funny historical biographies? Three reasons:

1) History is a science; hence historical fact is science fact, the bedrock of science fiction.

2) It is one of my favorite books in all the world, and if you don't let the book reviewer indulge himself once in a while he gets to thinking about chucking this business and going back to earning a living. And

3) There are two more pages of copy to be filled.

Will Cuppy's magnificent **The Decline And Fall Of Practically Everybody** is a quietly hilarious collection of biographies of 26 famous historical personages from Cheops (or Khufu) to Miles Standish—the parts you are *not* liable to read in your history books. I hasten to assure you that nothing in the book is made-up: every word is at least

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as true as anything in history. Cuppy's approach to biography was to read every single word available on his subject, and then throw out everything that wasn't ridiculous. He wrote other kinds of things—he was the author of *How To Tell Your Friends From The Apes* and *How To Get From January To December*—but this is his masterpiece. I have been using his overfrequent-footnote device in his honor (it is a rare page in *Decline And Fall* that is less than a quarter footnotes), and I would like to close with an excerpt from his biography of Nero:[9]

> [After the Great Fire] he rebuilt the city on a modern plan. The chief improvement was his Golden House, as he called it, an imperial residence a mile long, equipped with a revolving banquet hall, walls of gold and jewels, machines for squirting perfume in all directions, a duplex apartment for his pet ape, and a statue of himself 120 feet high. When he moved in, he said that at last he was beginning to live like a human being. I have been unable to think of an adequate comeback to that remark. You try it.
>
> Nero's singing has occasioned unfavorable comment, quite aside from the fire episode. He sang and sang, in private and in public, accompanied by his lyre, five thousand applauders chosen for their endurance, and a regiment of soldiers with drawn swords. He would step to the front of the stage with his personal bodyguard and ask his audience if they had ever heard a better singer. They always said no, they hadn't.[14] If you have been wondering why Nero sang, the answer is clear enough. People sing because they think they can sing.[15]
>
> He made his professional debut at Naples five years after the death of his mother. She was spared that, at least. The theatre was shaken by an earthquake during the show and collapsed after the final selection. Nero got away. Lightning frequently struck near the scene of his concerts. It missed him.
>
> He also went to Greece and sang for a year and a half, after which he returned to Italy and sang. Forty-one citizens conspired to slaughter him, but something went wrong.[16] Then he announced a recital at which he would play the pipe organ, the flute, and the bagpipes and sing a tragedy set to music by himself. The legions rose in Gaul and the Senate declared him a public enemy. As the troops advanced on Rome, Nero proposed to go and meet them and win their hearts by singing a few songs. Somebody had to explain. Assisted by Epaphroditus, his private secretary, he cut his throat on June 9, A.D. 68, the anniversary of his first wife's murder. Well, we're none of us perfect.

I have no faintest idea whether this book is still in print or available for sale; my copy has a cover price of 40¢. But perhaps if we all besiege Dell Books (One Dag Hammarskjold Plaza, N.Y. NY 10017) with requests, they'll reissue it. If not, you could aways haunt the second-hand bookstores. This one is worth a lot of searching.■

[9]Hereafter all footnotes are Cuppy's.

[14]Nero's voice was thin and weak. Had *it* possessed more volume, it would have been worse.

[15]At the age of twelve Nero had shown a lively interest in the arts, particularly music, painting, sculpture and poetry. Why was nothing done about this?

[16]I don't mind singers so much, if only they wouldn't practice.

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BRASS TACKS

Dear Analog Readers and Writers:

The purpose of this letter is to announce an important new project in science fiction scholarship: *The Letters Of John W. Campbell*, to be published in several volumes by Authors' Co-op Publishing Inc. The letters will be edited for publication by George Hay, in consultation with Malcolm Edwards, Adminstrator of the Science Fiction Foundation in London.

The importance of John W. Campbell's influence on modern science fiction need hardly be stated. Many of the writers whose work appeared in Astounding/Analog have testified to his remarkable editorial contribution. Campbell's letters, in which his influence is made apparent, are central to an understanding of the development of modern SF.

Unfortunately, Campbell did not start to keep copies of his correspondence until after 1950, and then only of his official editorial letters. We therefore request anybody holding Campbell letters from before 1951, or later personal correspondence, to forward copies to

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the publisher (address: Rt.4, Box 137, Franklin, Tenn. 37064). All letters will be copied and the originals returned promptly. Although the books will only feature Campbell's letters, where possible we would appreciate receiving copies of both sides of a correspondence, for purposes of annotation. (Nothing from letters not written by Campbell will be quoted without specific permission.)

It is our intention to establish two depositories for copies of the letters: one will be housed at the Science Fiction Foundation, the other at a suitable American institution. Access in both institutions will be strictly controlled. Anyone not wishing their letters to be deposited should so state.

It should be added that this project is undertaken with the permission of the Campbell Estate, and had the enthusiastic support of his widow, Mrs. Peggy Campbell, before her recent death. We welcome any help in tracking down Campbell's letters, and would appreciate any publicity you can give to this appeal. All general correspondence concerned with the project should be addressed to George Hay, c/o Reception, London House, Mecklenburgh Square, London WC1.

GEORGE HAY

Science Fiction Foundation
North East London Polytechnic
Longbridge Rd.
Oagenham, Essex
England

Dear Mr. Schmidt,

In reference to your editorial on the draft perhaps you will find the enclosed speech by Daniel Webster of interest. I think, in yearning for consistency in constitutional practice, you are chasing a will-o-the-wisp. People can, and in time will, corrupt anything. Especially when there are strong economic incentives for hypocrisy. And these same incentives motivate the perpetuation of the double standard as such and will prevent any attempt to bring word into conformity with deed. Even so, what would be the value of making the word confirm the fact of tyranny?

To my knowledge there was one draft case that went to the Supreme Court during WWI in which it was asserted that conscription was unconstitutional on the basis of the 13th Amendment. It was dismissed by the learned court's opinion that, "this argument is too absurd to consider, merely to state it is to refute it." (Although I am paraphrasing from memory here I believe this is essentially accurate; preposterous though it does seem.) In the face of such blatant and self-serving disregard, examples of which could be cited endlessly from American history, it doesn't much matter what the Constitution says. It is a golden calf.

CRAIG SPENCER

Box 113
Eastsound, WA
98245

Daniel Webster is, as usual, worth rereading; the speech that came with the letter was given by him on December 9, 1814. We don't have room to reprint it, but it shouldn't be hard to find in a library.

As for what value might be possessed by "making the word confirm the fact of tyranny," my real idea was that a periodic attempt to bring words into line with practice might force people to verbalize what they were doing and

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thereby shock them into critically re-examining the actions themselves.

Dear Mr. Schmidt:

Congratulations on your editorial on the draft in the July edition. It's the best piece of writing I've read on the subject so far, and, as a mother of a twenty-one-year-old daughter, I've read a *lot*. I hope it is widely quoted and reprinted. I'm sending it to my daughter and a wide circle of friends and contacts around the country.

One of the numerous ironies of the situation is that this will probably be the only instance in history where it will be better and healthier for women to be relegated to various shit-handling chores. While there may indeed eventually be some sort of "show" group of women combat troops to prove that they can be just as brainwashed as men, no government on Earth is going to put guns into the hands of *large* numbers of women.

JOANNE FORMAN
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Taos, N.M. 87571

Actually, history and anthropology suggest that it's very difficult to imagine any action which won't be tried by some group of people, some time.

To the Editor, ANALOG:

The editorial in the July 1980 issue on the draft was one of the worst pieces I have read on the subject. While purporting to be an attempt to stimulate thoughtful discussion, all it did was show that its author had done very little thinking on the subject himself. The most obvious example of his lack of homework on the matter was his "interpretation" of the 13th Amendment.

The 13th Amendment prohibits "involuntary servitude" and is often cited as possible grounds for prohibiting military conscription by those who, as your editorialist admitted, do not know much about the legal history of the issue. The aim of the 13th Admendment was the prohibition of slavery as practiced in the Southern states prior to the Civil War. There is nothing in the legislative background to the amendment to indicate that it was intended for anything else. Certainly it would have been illogical to have intended it to ban military conscription since the Union had used conscription itself in its successful war against the South.

But we have more than just logic to go on. The Selective Service Act of May 1917 was challenged in the courts and the 13th Amendment was one of the grounds cited. However the law was upheld at both the District and Supreme Court levels. At the Supreme Court the decision was unanimous against the use of the 13th Amendment to ban military conscription. (Selective Draft Cases. 245 U.S. 366 January 7, 1918.) The Constitutional basis for legal conscription was cited as Article I, Section 8 (the power to "raise and support armies") and the 14th Amendment which Chief Justice White argued "broadened the national scope of the government under the Constitution by causing citizenship of the United States to be paramount and dominant. . . . " Miltary service in the common defense of the country was ruled to be an obligation of citizenship. It is no more "slavery" to require that a person fulfill his obligations than it is to compel him to pay his debts.

There is every indication that this is

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the way the Founding Fathers would have wanted it. The Minutemen of the Revolution were based on the English militia system which had roots all the way back to the Anglo-Saxon *fyrd* of the 9th century. It was this freeman militia that slaughtered the French knights at Crecy and Agincourt. All able-bodied *free* men were considered to be in the militia and in 1778 the Continental Congress agreed to General Washington's request to draft men from the militia into the Regulars. Several colonies had already been using the draft to fill out their militia units. This had been the theoretical basis of all conscription legislation since. In 1794 the Congress under the new Constitution enacted a national militia bill which enrolled all "able-bodied free white male citizens" between the ages of 18 and 54 and established provisions for calling the militia into federal service. Besides foreign foes, these troops were also intended to combat domestic threats ("insurrection"). This does much to undermine the extreme libertarian view of the early Republic. It is wise to recall that the Founders were not simple-minded idealists, but practical men seeking solutions to their problems. Even Jefferson, in 1814, wrote James Monroe urging the enactment of universal military service in peace as well as war.

You will kindly notice that only those people who were considered full citizens were liable for service. You do not depend on "slaves" for your security. Of course, in those days rights and duties were considered to be linked. Now, the "me" generation can only think of rights while attempting to avoid any talk of duties. History has not been kind to societies that have declined to such a view of life.

One of the recurring themes of science fiction is the subject of survival traits. Clearly the social and legal institutions responsible for the mobilizing of a society's military potential can be listed under such traits. It would have made more sense to have approached the issue from that angle.

WILLIAM R. HAWKINS
Assistant Professor
Dept. of Economics
Appalachian State Univ.
Boone, North Carolina 28608

If you look carefully at what I wrote, I did not *say I knew* nothing *about the history of how the constitutionality of the draft had been defended. I said I was not familiar with the* details, *meaning I had not read the complete Supreme Court transcripts. Certainly I would not have ventured to write on the subject had I not known at least as much as you've told me in your letter. I still find the decisions you mention astonishing and a little scary, if there's no more basis for them hidden in those details than you or anyone else has brought to my attention. In essence, you're saying that a citizen can take no assurance from what the Constitution actually* says, *because the courts can decide that its authors (conveniently unavailable for consultation) meant something quite different. The amendment in question uses ordinary English words, found in any dictionary, in a straightforward way that means exactly what I said it meant. But that's not how it's applied. Shouldn't that be at least a* little *disturbing?*

Maybe the authors of the amendment should have been more careful to say what they meant.

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Dear Dr. Schmidt:

Concerning your July 1980 editorial about the draft. When I was in high school, in civics class, we briefly studied the Constitution. I remember the teacher pointing out one particular feature of the Constitution which Congress has exclusive use to, and uses exclusively. This is the commonly called "all necessary and proper" clause.

It states simply: The Congress of the United States shall have the authority to pass all laws which it deems necessary and proper to the functioning of the United States. Read that again. This is the granddaddy of all loopholes. Congress, and only Congress, has the authority to determine what it thinks would be in the best interest of the nation. If Congress thinks draft registration is necessary for this country, then it will become law.

(And yes, I do think the government would spend millions to set up a program they may not use. They've wasted millions already.)

Later, when I went to a university, my first major was Constitutional Law. I asked one of my professors which had preference: this clause or an amendment. According to him, the clause would have preference, because the majority of both Houses of Congress felt that a particular bill was necessary. Of course, any bill could be challenged in the courts, but the courts cannot alter any part of the Constitution. The "all necessary and proper" clause is still a part of the Constitution. It is still valid. And, lately it has become almost the sole reason Congress can pass legislation in any field they think it necessary.

If a draft registration bill is passed and the President signs it into law, it will be legal. And now you know where Congress gets its authority to do this.

C. LOWELL WHITE
Box 248
Gelliam LA. 71029

There's an analogous and very important rule among the Federal Aviation Regulations, which says in essence that a pilot may violate any of the other regulations if circumstances make it necessary. But it also provides that, having done so, he must be prepared to show why *it was necessary. Maybe Constitutional law needs a stronger analog of that corollary to go with the provision you've cited . . . .*

Dear Mr. Schmidt:

Regarding your editorial "Reasons," in the July 1980 issue of Analog concerning the revival of the draft: I would suggest that your interpretation of the Thirteenth Amendment can be challenged thus: "Involuntary servitude" means essentially *serfdom*. Serfdom differs from slavery in that the serf cannot be sold, and also has certain rights—the right to life, due process, perhaps some political rights, right to own property, and so on. The slave has none of these, at any rate in the Anglo-Saxon legal tradition. On the other hand, the serf *shares* with the slave the condition that he is not *paid* for his work. The Thirteenth Amendment means that nobody can be *owned* by others, nor can he be deprived of functional human rights nor can he be compelled to work *without pay*.

This interpretation, which seems to me to be entirely reasonable, would allow both the federal government and, I think, the states to conscript *anyone* by appropriate legal process, provided

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that the appropriate political authorities determined that his or her services were needed, and provided that he or she *be properly paid.*

I think it can be argued, on the other hand, that anyone who is paid less than the going wage for his services is *really not being paid* for at least part of those services. So, I think the arguments against conscription should really be based upon the inadequate pay given conscripts for whatever they are required to do.

What might serve as a basis for determining proper pay levels could be a problem. I'll suggest three possibilities. (1) Perhaps the pay level might be set at those levels attainable by mercenary soldiers. This would make the base pay for a qualified infantry rifleman something like $1500 per month, I believe, at today's rates. (2) Perhaps the rates might be comparable to those in the Merchant Marine. An AB seaman currently signs on, I believe, for about $1500 per month—though I may be behind the times on this. (3) Or the pay levels might be set at something like the comparable rates in private industry at comparable skill and risk levels. The buck private just beginning his basic training is at something like minimal risk, minimal skill level; fair pay for him would begin at about $5.00 per hour. Of course, considering time and a half and double time and the fact that he's on duty 24 hours a day seven days a week, we're really talking about $1780 per week or $7480 per month. A skilled workman in a high risk situation—I should think any combat-ready soldier should be considered certainly a skilled workman—should be paid somewhere between two and five times that. Comparable injury and death benefits should be provided as well, of course.

It is obvious that anything approaching these rates of pay would make conscription intolerably expensive. At pay levels far below these, it should be possible to recruit as many soldiers, at any desired level of ability as the country could reasonably want. In wartime, of course, it might be harder—but this should encourage political leaders to assess more carefully the real costs of military adventures.

ALBERT H. JONES PH.D
1501 N. Woodridge Ave.
Muncie, Indiana 47304

Well, it's an interesting angle, but your interpretation has one implication I find very disturbing. You seem to be saying that it's all right to force anybody to do anything, *provided you give him what somebody else decides is adequate money. But what if the forcee has little interest in money (yes, Virginia, there* are *such people) but is strongly opposed on principle to what he is being forced—and "paid"—to do?*

Dear Mr. Schmidt:

While Socrates taught by questioning, you teach nothing and cleverly undercut the country giving you affluence and freedom.

If I had read your editorial article (July) prior to purchasing your magazine I most certainly would not have bought it.

The young people of today with our sad tendency to bring the most intelligent down to the level of the least has apparently produced a generation of non-readers (also non-calculators, non-writers, and almost non-thinkers) for

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reading stimulates thought. I asked a young person the other day—(this is true experience) what he would do if the Russians in their bid for world domination actually succeeded in taking over the United States. "Do?" he said, "Life would go on for me just as usual". So, from lack of ability to read and study history (for W.W.II was before a teenager's birth) for real intent and thought, he actually believed there would be no changes under subjugation by the U.S.S.R. This, in light of all the evidence of the problems and virtually anihilation of countrie's individuality and control so evident worldwide today. We only have to look thirty miles from the U.S. to see Russian philosophy at work in Cuba. And you have the guts to state that we ought to doubt the immediate necessity for a draft that would take at least two years to set up! Without offering a better alternative like an eight year old. And teenagers who disagree with everything but offer no better substitute whatever. Revolting.

I served in W.W.II to keep this country out of the hands of tyrants, but I see it will be handed over to whoever wants it by just such doubt producers as yourself. I realize you merely said think about it. But that is a most clever approach to a grave problem and offers no better solution.

It is a clever philosophical approach you are using, worthy of the best Russia has to offer. I am sad for you.

JAMES H. BARRY
8242 Garibaldi Avenue
San Gabriel
California 91775

And I for you. Do you really think it is in the best traditions of this country to accept without question whatever you're told, and that questioning should be forbidden? If you've read as much history as you imply, I should think you would know that this country was founded *by a group of people who got together to consider the question of what form of government would best suit their needs—and that one Thomas Jefferson observed at least once that such questioning needed to be repeated periodically. I agree.*

I do not *agree that I or anyone else must refrain from asking a question until I have a better answer than all the generations before me. I am willing to admit that the problem is too big for me and I don't* have *an ideal answer. But it is foolish and dangerous to assume that the old answers are the only answers, and if enough people think about it,* somebody *may see the way to a better one. But who will bother to try, if no one asks the question?*

Dear Mr. Schmidt:

Jerry Pournelle does not need to be defended, by me or anyone else, and to comment at this point might be superfluous, but Jean Anstey's 'violent exception' to Mr. Pournelle's coming-collapse-of-civilization prediction (Brass Tacks, July) does not strike me as being particularly well thought out.

Its main weakness seems to be the implication that society in the 1980's is substantially the same as it was 600 years ago. On a superficial level this might appear to be the case, but the development of every technological system we have has altered society in ways too extensive to be easily analyzed. To take the most obvious points: modern society 1) is composed of a *vastly* greater number of individuals and

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therefore 2) requires enormously complex (and increasingly less efficient) technological systems to maintain itself. As Roberto Vacca pointed out in *The Coming Dark Age*, the more complex a system is, the less it takes to disrupt it completely. The 14th century lacked this complexity almost entirely—which may have aggravated its problems to some degree, but which certainly inhibited the extensiveness of their effects in some ways as well.

If Ms. Anstey still doubts, I suggest that she look at the popular response to the last power outage in New York City—and imagine it multiplied by a million or more.

MICHAEL E. STAMM
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Eugene, OR. 97401

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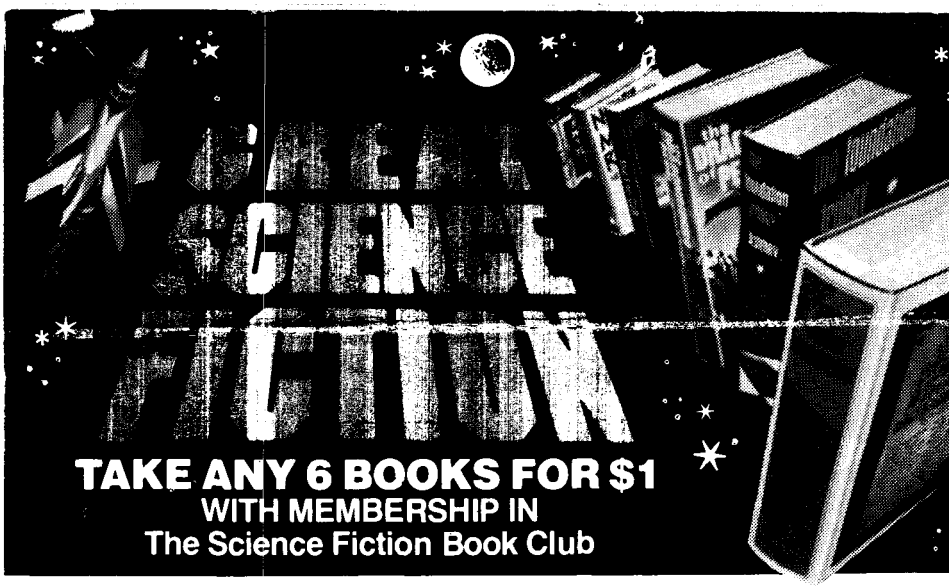

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